POPULAR SCIENCE

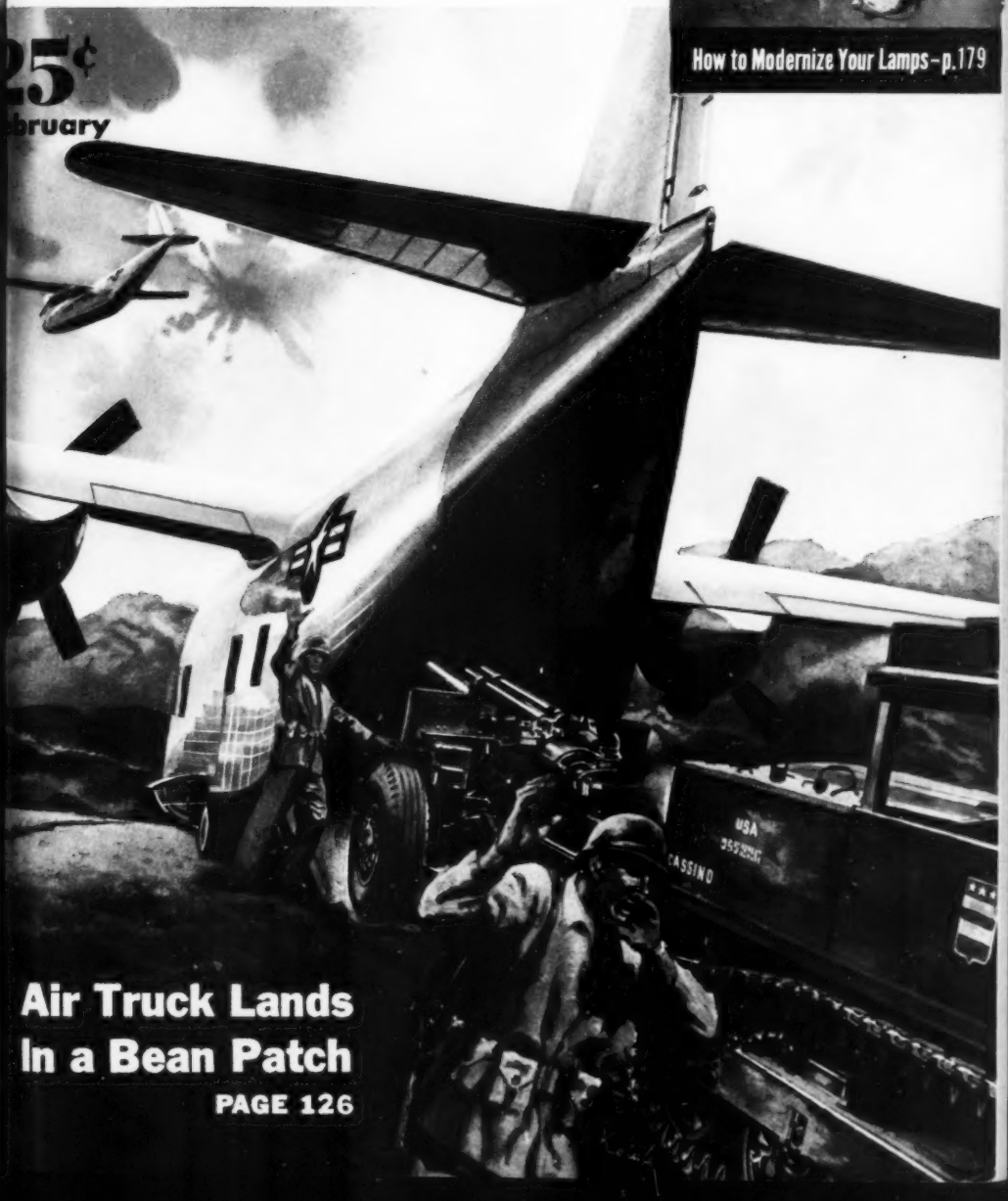
MONTHLY

MECHANICS AND HANDICRAFT

How to Modernize Your Lamps–p.179

25¢

bruary



Air Truck Lands In a Bean Patch

PAGE 126

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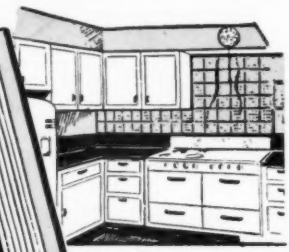

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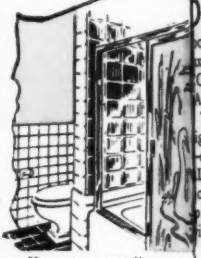

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1001 Money-Saving Ideas on EVERY Phase of Home Improvemen Show How YOU Can Have the Luxury Home You've Longed fo

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Correcting Sagging Wall
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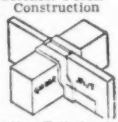
Woods for Exterior Trim
Woods for Porches
Woods for Interior Trim
Woods for Siding
Rafters, Layout Terms
Repairing Interior Walls
Terrace, Porch Construction



"How-To" sketches show you EVERY type of joist you'll ever need!

MILLWORK, WINDOWS, DOORS, SCREENS, FLOORS
Floors—Nailing, Laying, Finishing
Edgings, Doorways
Storm Windows, Doors
Shelves, Cabinets
Adjusting Doors
Built-In Furniture
Bathroom Cabinets
Closets, Working Bins
Joining Roof to Walls

ROOFS, INSULATION, VENTILATION, FLASHING
Installing
Flashing—Diagrams, Instructions, Valleys, Chimneys, Hips, Windows, Doorways, etc.
Types of Insulation
Insulating Farm Buildings
Types of Shingles, Walls, Roofs, Hips, Ridges, etc.
How-To, How-Not-To Ideas
Tips on Repairing, Replacing
Leaks in Old Roofs
Roofing, Instructions

PLASTER, LINOLEUM, TILE
Tileboards
Repairing Walls
Tile-Laying Tips
Wall Plaster Mixing
Exterior and Interior Wall-Door, Window Openings, Trims
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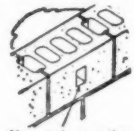

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Linoleum Laying
Lifetime Wall Coverings
Repairing Ceilings
Installing New Ceilings
Making Rooms Seem Larger, Wider
Installing Ceiling Panels

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Building Fireplaces
Plumbing, Pipes of All Kinds
Faucet Installations
Coal Bins, Construction
Fixtures, Tubs, Sinks, Showers
Saving on Fuels
Duplex Bathrooms
Chimney Construction
Hot Water Systems
Making Woods Fire-Resistant

PAINTS, VARNISHES
Tinting
Cleaning Paint Spots
Floor Sealers
Decorating Old Floors
Color, Decorating Tips
Types of Finish—When, Where, How to Use
Whitewashing Ingredients
Painting Wood Floors
Paints for Brick, Concrete, Plaster

TOOLS, NAILS, HARDWARE
Scaffolds
Ladders, Use and Precautions
Sliding Windows
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Screens—Repairing, Replacing, Construction, Painting, Installation
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Mechanics and Handicraft

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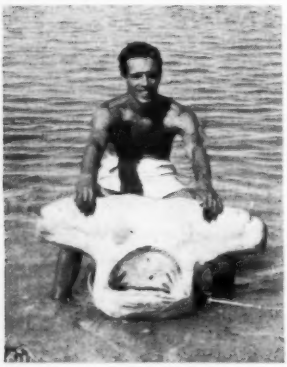
This Month's Big Features:

Chrysler Unveils Dream Sports Car 99
What's New in '52 Cars 104
Over the North Pole on One Engine 110
Electric Sparks Carve Hardest Metals 117
Shaw Drives the '52 Hudson 122
Air Truck Lands in a Bean Patch 126
He 'Invented' a Way for You to Make Money .. 143
America's Fastest Freight Train 153
200-Lb. Truck Engine Hauls 21-Ton Load 163
Which Twin Has the CMC? 167
House as Changeable as a Woman's Mind 173
How to Improve the Lamps You Have 179
Balancing Engines for Peak Speeds 190
Gus Helps Tie a Knot 196
Screened Porch Is Winter Prefab Job 208
Butler's Table Has Lift-Off Tray 216
How Flying Cameramen Get Pictures 220
Robot Messenger Saves Steps 227



It's sport, they say—underwater fishing with a spear gun. If you're lucky you may come back alive, with a trophy like this 1,160-pound hammerhead shark. For a blow-by-blow account of the three-hour running battle that led to the victory photo above, see page 148.

(More features and departments are listed on page 4.)

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ADVERTISING OFFICES: NEW YORK — 353 Fourth Ave.; CHICAGO—360 North Michigan Ave.; DETROIT—820 Book Bldg.; SAN FRANCISCO—681 Market St.; CLEVELAND—328 Citizens Bldg.; LOS ANGELES—1052 West 6th St.
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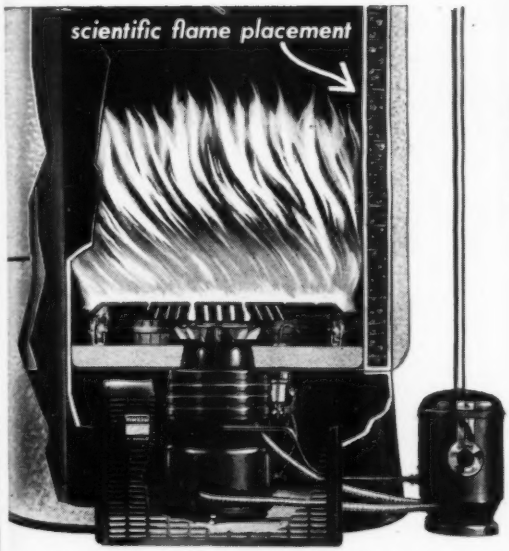
Published monthly at 353 Fourth Avenue, New York 10, N. Y., by Popular Science Publishing Co., Inc., Godfrey Hammond, President and Treasurer; R. C. Wilson, Stephen P. Glennon, Vice-Presidents; F. W. Briggs, Secretary. Entered as second-class matter Dec. 28, 1918, re-entered as second-class matter July 26, 1948, at the Post Office in New York, N. Y., under the act of March 3, 1879; additional entry as second-class matter at Dayton, Ohio. Entered as second-class matter at the Post Office Department, Canada. Printed in U.S.A. Copyright, 1952, by Popular Science Publishing Co., Inc. All rights reserved in the United States, Great Britain, and in all countries participating in the International Copyright Convention and Pan-American Copyright Convention. Yearly subscriptions to United States, its possessions and Canada, $3.00 (2 years, $5.50; 3 years, $7.50); foreign countries $1 per year extra. Four weeks' notice is needed to change a subscriber's address. Please give both old and new addresses, including postal zone numbers.

here's how — it cuts your fuel oil costs!



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Picture Features

Doctor Survives Man's Suddenest Stop....108
Third Dimension for Home Movies.....114
Overhead-Valve Engine Powers Lincoln..134
Walking Shovel Scoops 27 Tons.....140
Mercury Remodeled Inside and Out.....158
Desert Posse Mounts 45 Jeeps.....172
Bike Designer Rolls His Own.....176
Atomic Energy Heats a Building.....177

Mechanics & Handicraft

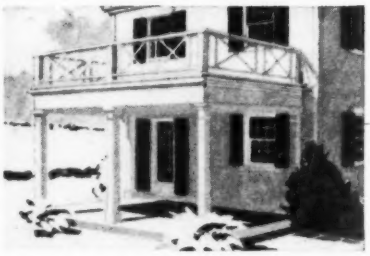
Look What They Did with a Bottle.....186
Pop-Up Trunks Are Here at Last.....188
Keeping Your Battery Alive.....195
How to Fix Car Locks.....202
How to Build Double-Deck Bunks.....204
Viewer Shows Atomic Explosions.....206
Build a Box for a Valentine.....215
Refrigerator Reminders.....219
One-Evening Shop Projects.....224
How a Pro Covers a Cornice.....232
Engraving with Phonograph Needles.....236

Departments

Letters 16
New Ideas from the Inventors.....131
I'd Like to See Them Make.....142
Aids to Modern Living.....146
Keeping the Home Shipshape.....161
P.S. Last Minute News and Notes.....178
Hints from the Model Garage.....199
New Shop Ideas.....234
New Tools.....240

NEXT MONTH . . .

Ways to Use a Porch Roof



Over many porches there's a lot of good space that never pays its rent. An article in the March issue will show you how to make these idle roofs go to work. An extra room for guests, space for sun bathing are just two poss bilities. You can make most of the changes yourself.

Take a tip from "Mr. Industry"

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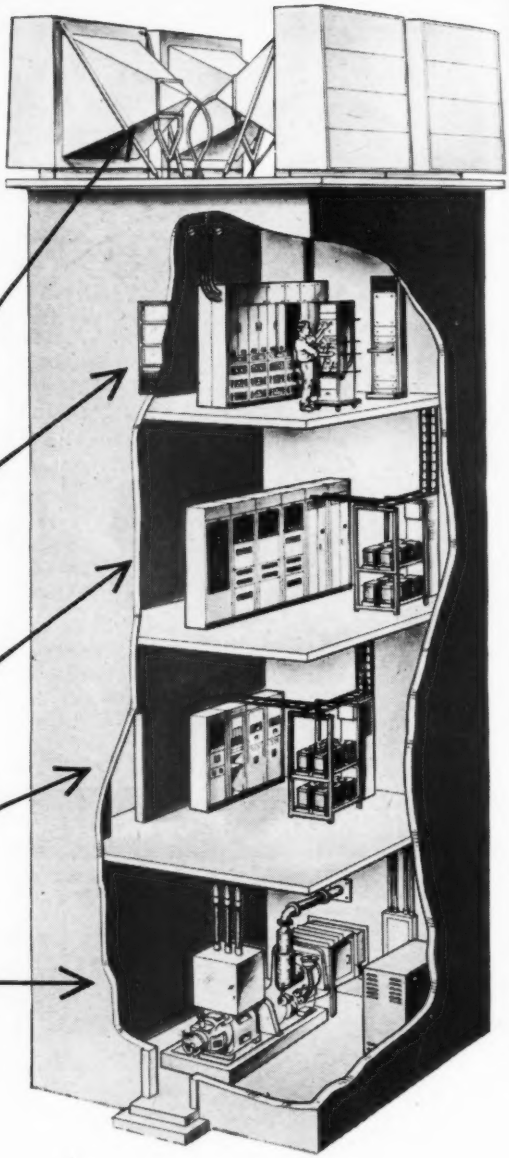
What's inside a *Radio-Relay* station?

Because microwaves travel in straight lines and the earth is round, there are 123 stations on the transcontinental television route between Boston and Los Angeles. This view of a typical unattended station shows the arrangement of the apparatus which amplifies the signal and sends it on.



ON THE ROOF are the lens antennas, each with its horn tapering into a waveguide which leads down to equipment

ON THE TOP FLOOR, where the signal is amplified, changed to a different carrier-channel and sent back to another antenna on the roof. Here are testing and switching facilities. Normally unattended, the station is visited periodically for maintenance.

ON THE THIRD FLOOR are the plate voltage power supplies for several score electron tubes.

ON THE SECOND FLOOR are filament power supplies. Storage batteries on both floors will operate the station in an emergency for several hours, but

ON THE GROUND FLOOR is an engine-driven generator which starts on anything more than a brief power failure.

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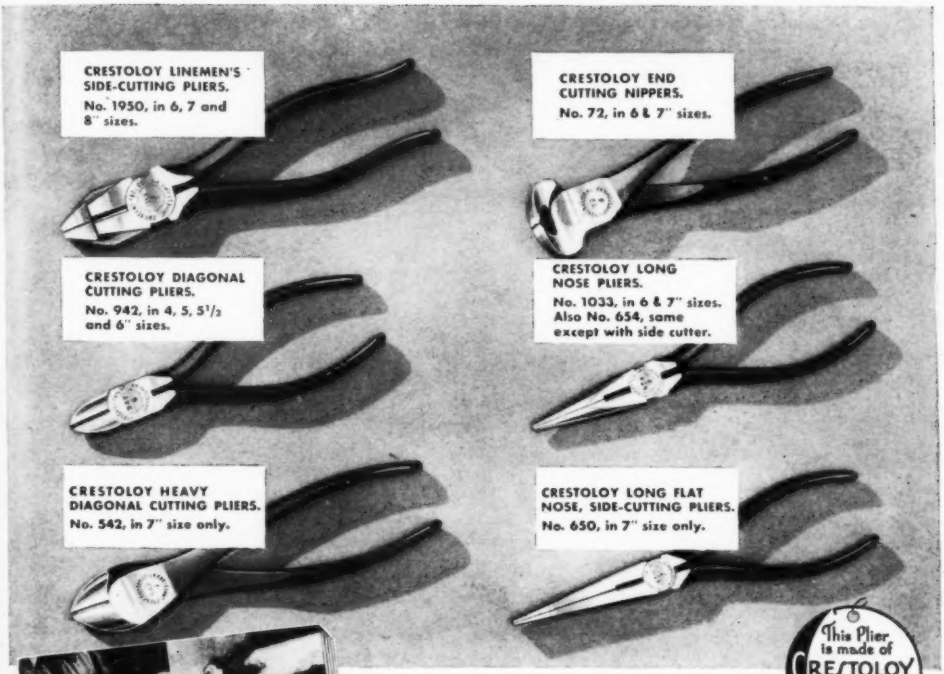

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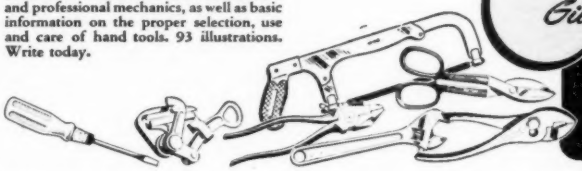

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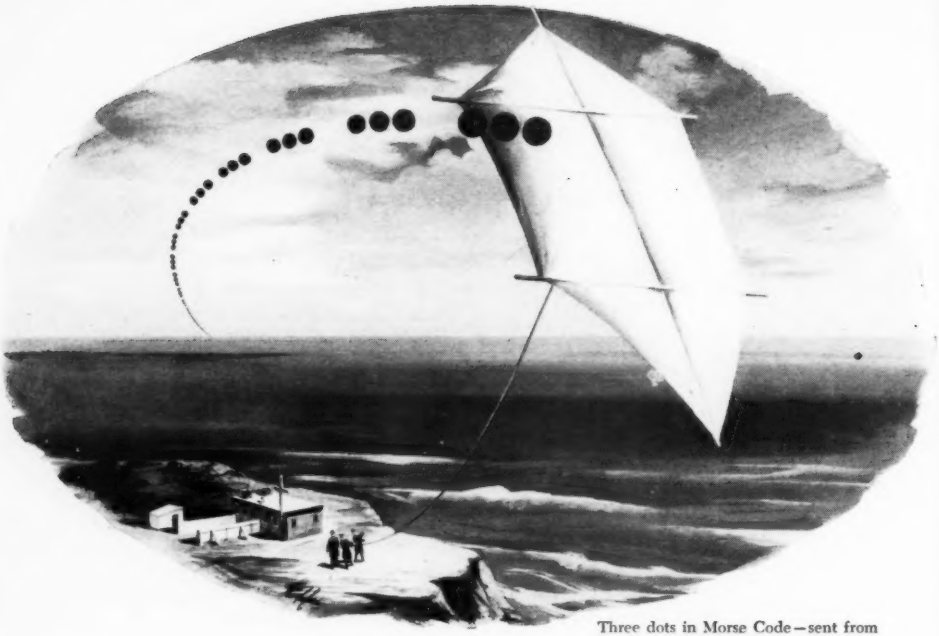

Three dots in Morse Code—sent from England and received by Marconi in Newfoundland—proved that wireless signals could span the Atlantic.

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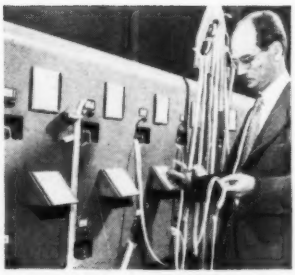

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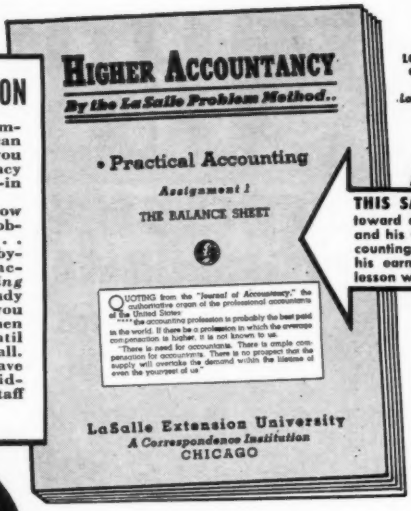

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City, Zone & State.....
Present Position.....

I Trained These Men

E. J. STREITENBERGER, New Boston, O., sa ing course, I mad week fixing set time. Now se Television sets

PHILLIP G. Louisville 8, K have been oper Servicing busi years I did $14 business; net p

S. W. DINWIDDIE, ville, Ill., writes, "S finishing course, wo servicing shop. No Engineer of WCUN Police Radio Instal

A. HERR, New C Pa., writes, "Hav doubled my salary since starting in Radio full time. Am employed by Station WKBO as transmitter operator. Future looks bright to me."

L. HAUGER, San Bruno, Calif., tells us, "I accepted a position as Radio and Television Technician . . . promoted to manager of Television Service and Installation."

LEANDER ARNOLD, Pontiac, Mich., says, "While learning, made $5 to $10 a week repairing Radios in my spare time. Now I have a spare time shop in my home."

NORMAN H. WARD, Ridgefield Park, N. J., writes, "4 years ago, I was a bookkeeper with a hand-to-mouth salary. Now I am employed by a key ABC station."

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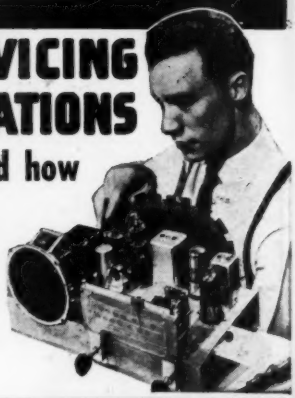

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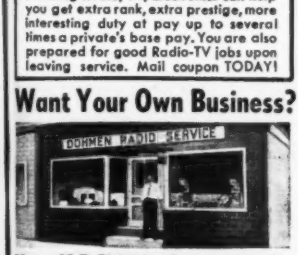
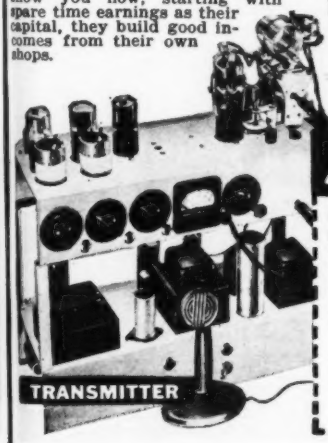


Many N.R.I.-trained men operate successful Radio-Television sales and service businesses. Let me show you how, starting with spare time earnings as their capital, they build good incomes from their own shops.



DO YOU want good pay, a job with a bright future and security? Would you like a profitable shop of your own? The fast growing, prosperous RADIO-TELEVISION industry is making these opportunities for you. Radio alone is bigger than ever. 90 million home and auto Radios, 3100 Broadcasting Stations, Two-Way Radio for buses, taxis, etc., are making opportunities for Servicing and Communications Technicians and FCC-Licensed Operators.

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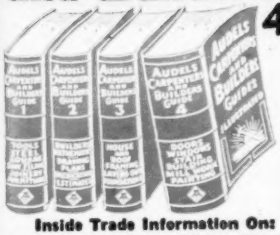

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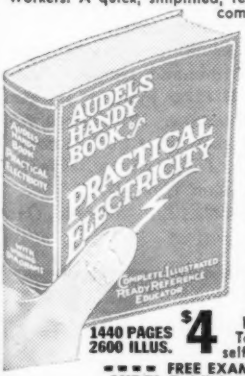

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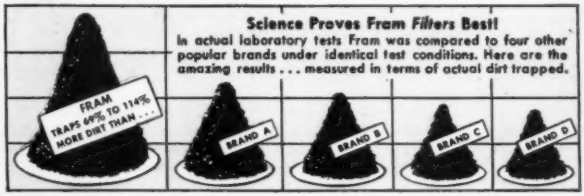

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Letters

Can You Coin a Word?

I would like to suggest that POPULAR SCIENCE conduct a contest to find a word to describe crossing a street against a red light, just as the word "jay-walk" describes crossing at other than an intersection.

There is reason to believe that the word jay-walk has had a deterring effect where this objectionable practice is concerned, and a second coined word might have a similar desirable effect.

JOHN W. NESTLER, Tampa, Fla.

Okay, contest is on. The best entries (decision of the judges is final) will be published from time to time in this space.

Gus Too Good to be True

There's only one thing wrong with Gus the garageman—he isn't true! Garagemen today are out to do just as little as possible at the highest rates possible. More than half the time, they haven't the first inkling of all the wonderful hunches and ideas that Gus has. I guess those good old days are gone forever.

CDR. E. F. HAYES, USN
Lexington Park, Md.

Any garagemen want to step up and defend themselves?

Wayward Moose Finds Home

In the letters section of the November issue Mr. Cyril Keene Jr. of Baltimore pokes fun at a sign he saw in Maine last summer that read: "Danger—Moose Crossing." The sign, which is located just west of Bath on Route 1, means just what it says. It apparently was no joke to Mr. Joseph Tardif, whose car was recently struck and run down by a 900-pound bull moose who forgot to look both ways before crossing.

After moose and car were separated, they trucked the huge animal away to nearby Hyde Memorial Home, a hospital for crippled children. The home treats all crippled children regardless of ability to pay and has been particularly helpful in polio cases. The moose meat, in view of the present high price of meat, was especially welcome at the Hyde Home.

ROGER M. LUKE, Bath, Me.

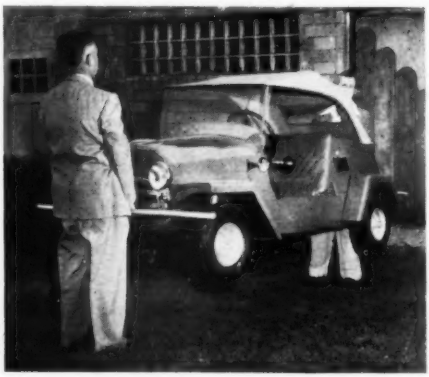
No Kidding

Whom are you trying to kid with the picture on page 105 of the November issue? This shows two men and two women "lifting" the 500-pound King Midget car, but the woman in the foreground has her arms bent. She certainly couldn't be lifting her share, or 125 pounds. Is there a support behind her?

D. H. EADES, Hopewell, Va.

No, there isn't. As the article stated, most of the car's weight is at the back. One man can easily lift the front end by himself. The girl's share is nearer 40 pounds than 125. It's the men who are carrying the big load.

For a real weight-lifting feat, look at the photo below, which was crowded out of the



story. Claud Dry (foreground) and Dale Orcutt, designers and builders of the car, held it up unaided while PS shot this photo.

PS Pays Its Way

Thanks for the article, "A Well-Strained Diet Saves a Car's Engine," 'way back in your January, 1951, issue.

The information on the breather cap was helpful recently in saving me about $60. I was about to have a ring job on my 1948 Dodge, because it was using a quart of oil about every 250 miles. Reading the tip

INVENTORS

If you believe that you have an invention, you should find out how to protect it. The first step is to have a search made of the prior pertinent U. S. patents. If a report on this search indicates that the invention appears patentable you can apply for a patent, and the specifications and claims should be prepared.

The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

Unless you are fully familiar with the U. S. Patent Laws, we recommend that you engage the services of a Registered Patent Attorney to protect your interests. The patent laws are *your* laws. A patent gives you the right to prevent others from making, using or selling the invention claimed in your patent for a period of 17 years.

Use these patent laws for your protection. Investigate whether your invention can be patented. If you have what you believe to be an invention, we suggest that you have this firm make a search for you.

Send for a copy of our Patent Booklet entitled "How To Protect Your Invention," containing information about patent protection and patent procedure. Along with this we will also send you an "Invention Record" form, for your use in writing down and sketching details of your invention. We will mail them promptly. No obligation. They are yours for the asking.

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*Men in 10 cities nationwide compared New Schick Injector Razor and Blades with whatever they had been using. About 80% of the men had a preference. Of these, the votes were in the ratios shown above.

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SCHICK INJECTOR

RAZOR & BLADES

about having the *air inlet facing toward the fan* recalled to me that the breather cap on my car was facing in the opposite direction. After making this simple change, the oil level in the crankcase was only a quart low after 1,000 miles.

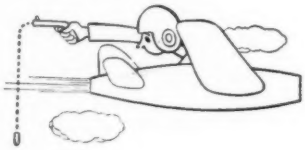
I can now afford to buy POPULAR SCIENCE for 20 years and still come out ahead.

JOHN M. FALCON, Baton Rouge

When Bullets Stand Still

"How We'll Fly to Venus," in PS for November, said on page 173:

"This would be like firing a bullet backward from a plane flying forward at the same velocity. The bullet, obviously, would stand still in mid-air, then fall vertically under the pull of gravity."



I wish you would explain this "obvious" action.

RONALD STECK, Boswell, Pa.

Gladly. Suppose a gun, which fires a bullet at a muzzle velocity of X m.p.h., is mounted on a platform traveling at Y m.p.h. If the gun is pointed rearward and fired, the velocity of the bullet in space will be X minus Y m.p.h.—its muzzle velocity less *the velocity already imparted to platform, gun and bullet in the opposite direction. And if X and Y are equal, as in the example quoted, the result of the subtraction will be zero m.p.h. In other words, the bullet will stand still, and will simply fall vertically to earth. With aircraft approaching bullets in speed, this mathematical fantasy no longer seems as remote as it once did.*

PS Finds Double Use

I have found that anyone can knock dents out of a car by simply using a magazine such as POPULAR SCIENCE.

By placing the magazine against the metal and hammering through it, the metal will assume its original shape without leaving hammer marks.

HOWARD J. COCKER, B.M./2, USN
San Francisco

Good—but read the magazine first.

I'm Tim Moylan, and this is where I did my I. C. S. assignments—to get the equivalent of the high school diploma I missed out on when Uncle sent me "greetings."

The boys who stayed home and graduated got a head start. So when I was discharged, I took a job at a gas station and studied nights—got my diploma the I. C. S. way. I'm managing one of those big city pump stations now—they were looking for somebody with ambition and a high school education. I. C. S. helped me.

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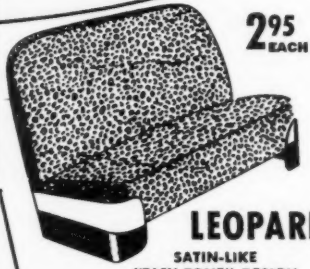

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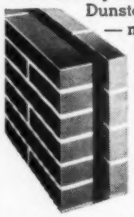

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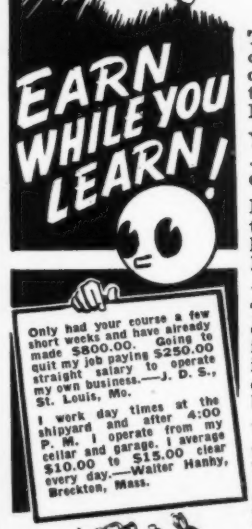

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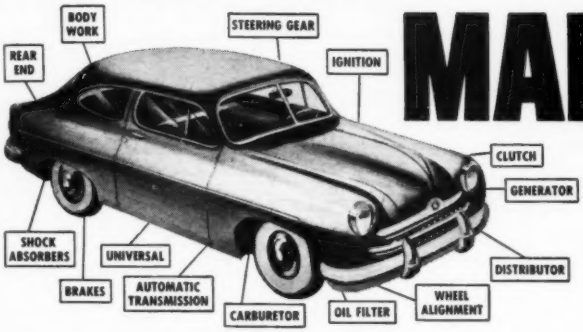

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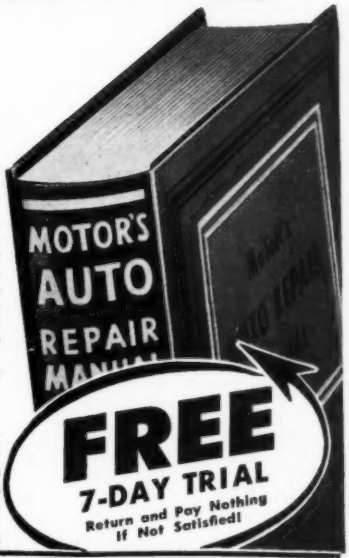

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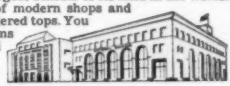

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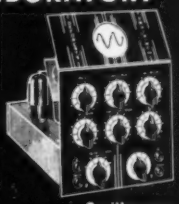

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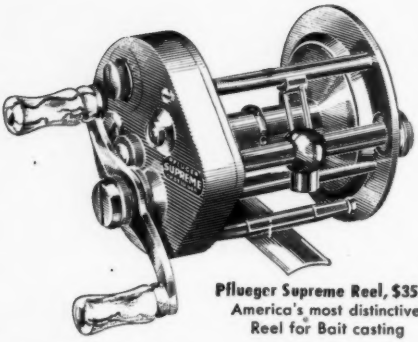

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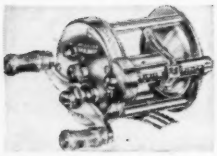

Pflueger Skilkast Reel $10.50
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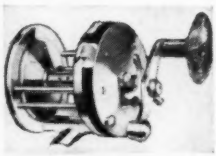

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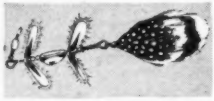

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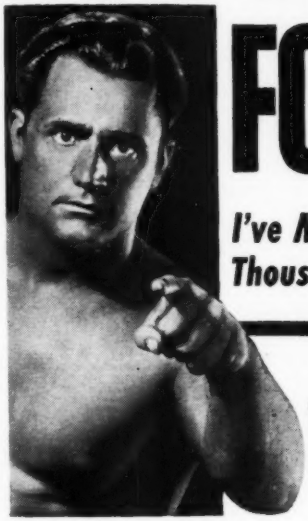

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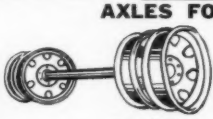

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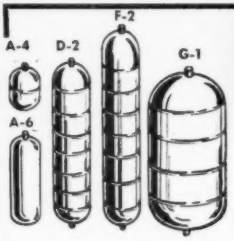

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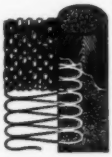

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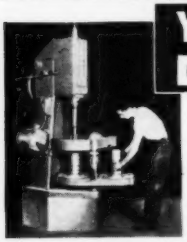

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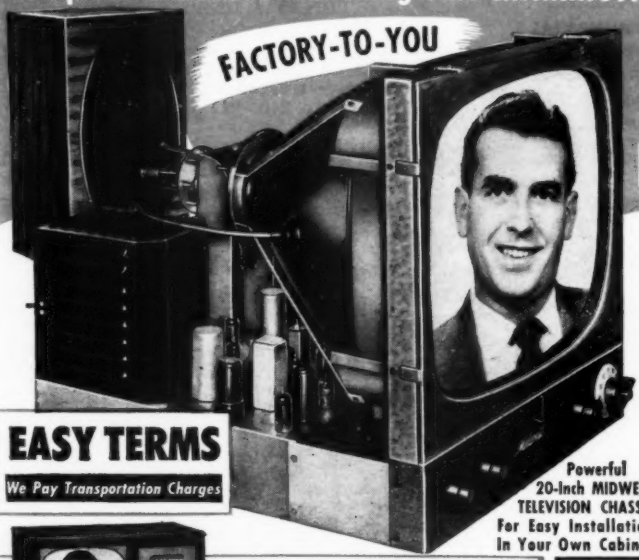

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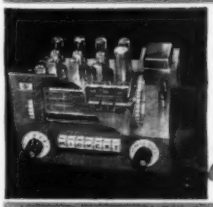

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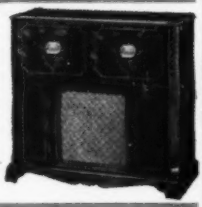

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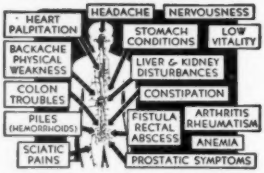

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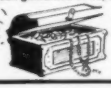

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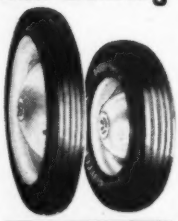

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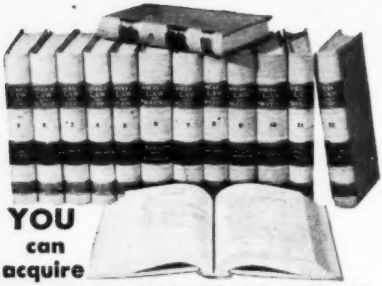

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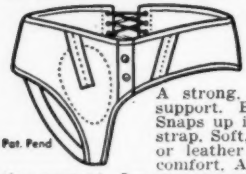

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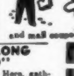

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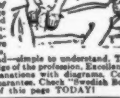

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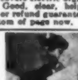

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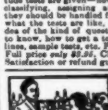

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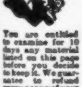

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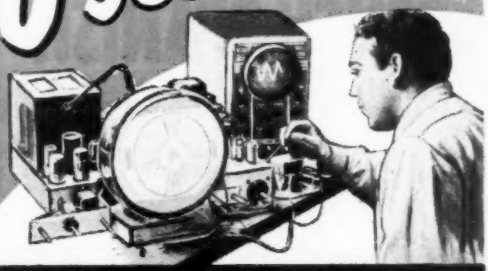

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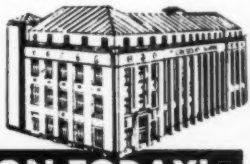

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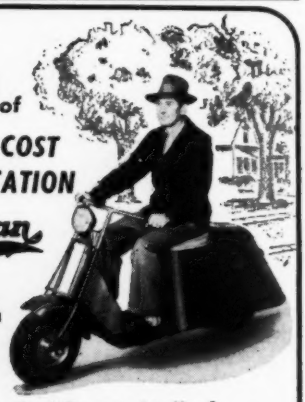

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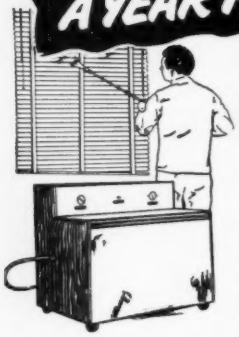

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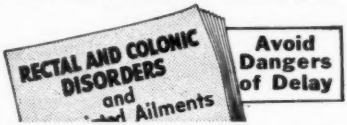

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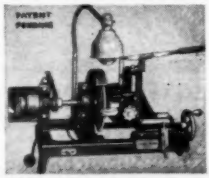

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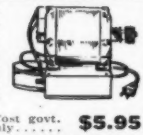

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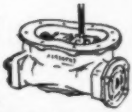

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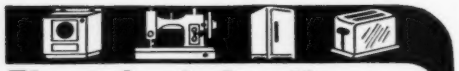

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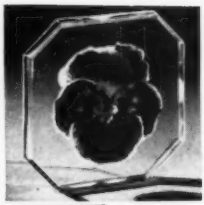

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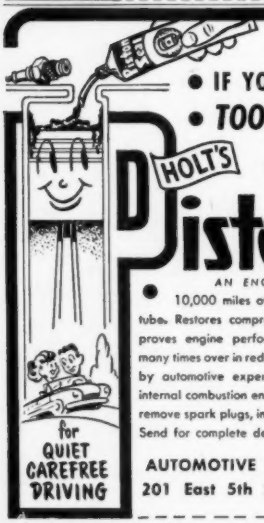

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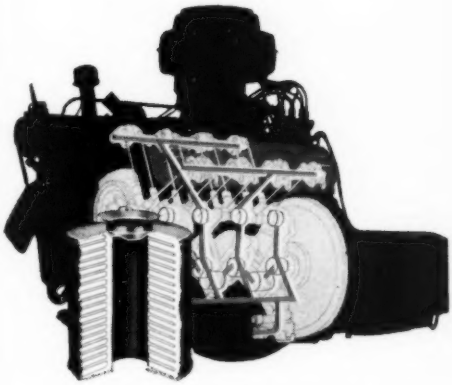

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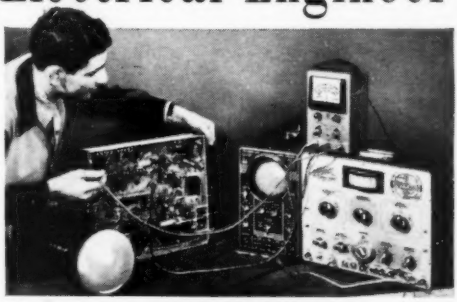

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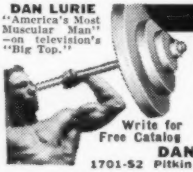

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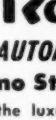

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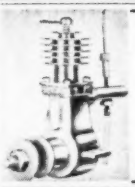

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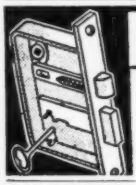

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"Woven-Gards" are hand protectors, mitts, pads, sleeves and aprons made of a new long-wearing safety material. Provide flexibility, comfort, resistance to abrasion and cutting far beyond anything used before. Extremely oil-absorbent, excellent for handling oily, slippery sheets. Porous weave makes them one of the finest protectors for handling lower temperatures. Enthusiastic users say they have never seen values like "Woven-Gards." Excellent protection at lowest cost. Send now for descriptive folder and prices.

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Easier starting in any kind of weather

engine runs to keep it warm whenever necessary

(By Automatic Thermal Control)

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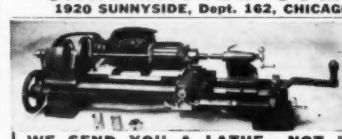

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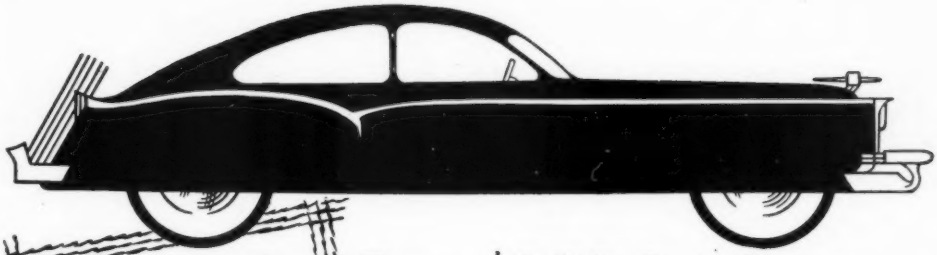

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Amateurs Only! Our students not eligible. Make copy of car 8" long. Pencil or pen only. Omit the lettering. All drawings must be received by March 31, 1952. None returned. Winners notified.

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That Power, he says, can transform the life of anyone. Questions, whatever they are, can be answered. The problems of health, death, poverty and wrong, can be solved. In his own case he was brought back to splendid health. He acquired wealth, too, as well as world-wide professional recognition. Thirty-nine years ago he was sick as a man could be and live. Once his coffin was bought. Years of almost continuous tropical fevers, broken bones, near blindness, privation and danger had made a human wreck of him, physically and mentally. He was about to be sent back home to die, when a strange message came—"They are waiting for you in Tibet." He wants to tell the whole world what he learned there, under the guidance of the greatest mystic he ever encountered during his twenty-one years of travel throughout the world. He wants everyone to experience the greater health and the Power, which there came to him. Within ten years, he was able to retire to this country with a fortune. He had been honored by fellowships in the World's leading geographical societies, for his work as a geographer. And today, 39 years later, he is still so athletic, capable of so much work, so young in appearance it is hard to believe he has lived so long.

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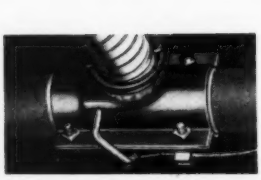

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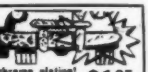
OLD BUMPERS LIKE NEW!



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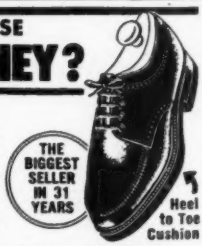

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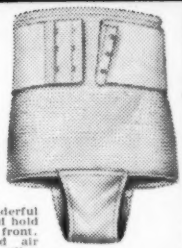

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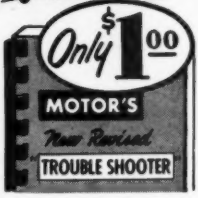

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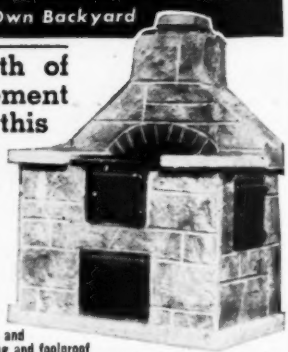

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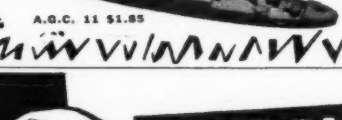

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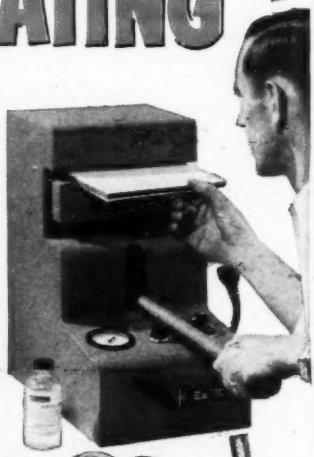

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EARN Money Evenings, copying and duplicating comic cartoons for advertisers. Adservice. Argyle 2. Wisconsin.

UNLIMITED cash full or part time. Details. P. O. Box 165. Collingswood 7. N. J.

WE pay you highest rates for hand-decorating greeting cards. Work home. Experience unnecessary. No selling required. Greetings, 100 Madison. Detroit 26.

LEARN Mailorder Selling. Free Details. Greenlawn Enterprises. 15378 Greenlawn. Detroit 21. Michigan.

FREE Book "505 Odd, Successful Businesses" Work Home! Expect something Odd! Pacific-35C. Oceanside. Calif.

UNPAINTED Plaques, Bookends, Novelties, Stamp brings list. Umlauf. 239 So. Luther. Detroit 25. Michigan.

TYPE For Pay (20-Ways)—Free Literature. McAllister. 1513-PS Charlotte. Bronx.

HOW to successfully use the methods, laws, principles that make you rich. Write Morley Publishing Co., 425 43rd Street. Sarasota. Florida.

39 FORMULAS, PLANS, ETC.

FORMULAS, trade secrets, for nearly everything. Catalog free. Creative Publishers. Winnetka 7. Illinois.

LATEST manufacturing formulas, for profitable, easy to make chemical specialties. Lists free. Automotive Chemical Laboratories. Box 393-B. Hicksville. N. Y.

FORMULAS—All kinds. Latest products. Literature free. Kemico. Park Ridge 15. Ill.

FORMULAS—$1.00 each. Send no money —Pay on Approval. Kelly. 9544 Whitcomb. Detroit 27. Michigan.

YOURS. Free catalog profitable formulas. Chemsel. Box 201. Cincinnati 14. O.

500 FORMULAS $1.00. 10,000 Formulas $4.00. N. Green. Corinth. New York.

FORMULAS, latest. Catalog—Chemical Instruction Sheet 10c. Belfort. 216 West Jackson. Chicago 6.

LABORATORY tested formulas. Lists free. Pont. Box 635-PS. Terre Haute. Ind.

ANY Formula $2.00. Satisfaction guaranteed. Jack. Chemist. 4292 Parkside. Philadelphia.

40 PLASTICS

LUCITE, Plexiglas. Any size sheets masked Square foot (12 x 12) cost 1/16" $1.20; ⅛", $1.40; 3/16", $1.75; ¼", $2.08. Include 10% postage. Almac Plastics. 230 Fifth Avenue. New York 1. New York.

PLASTIC Sheets, low prices. Instruction Manual, complete catalog, 50c postpaid. Plastic's. Box 1812. Salt Lake City 10. Utah.

NEW liquid casting plastic. Clear, colors. Embed flowers, insects, coins. Saw, drill, carve. Send 25c for Wholesale Catalog and New Sales Manual showing how to make money at home. Castolite. Dept. B-102. Woodstock. Illinois.

LEARN Plastics at home. Small cost—Spare time. Dime brings sample plastic, three experiments, full details. Plastic Projects. Box 5151. Detroit 35. Mich.

PLASTIC Sheets, Rods, Tubes, etc. Free List. Plastic Supply Co., 2901 N. Grand Blvd., St. Louis 7. Mo.

PLASTICRAFTERS supplies wholesale. Literature 20c. Cosmopolitan. Box 176-PS. New York 8. N. Y.

41 CHEMICALS & APPARATUS

LUMINOUS Paints will glow in dark. Six colors. Fairmount Chemical Co., 136 Liberty St., New York City 6.

NEW Idea Chemical and Apparatus Outfits for Home Experimenting. Photo-Scales. Microscopes. Chemicals. Biological and Laboratory Supplies in Small Quantities. Catalog 25c. Established 1931. John H. Winn. 124-B West 23rd Street. New York 11. N. Y.

LABORATORY Apparatus, Chemicals, Microscopes. Complete Chemistry Sets. Minerals. Uranium Ore. 10c brings catalog. Porter Chemical Company. Hagerstown 2. Maryland.

SPECTROSCOPE for quick chemical analysis $3.00. Book 200 electric stunts $1.00. Cutting Sons. Los Altos 2. Calif.

CHEMICALS and apparatus for industrial, analytical, and private laboratories. Catalog 20c. Dept. M-26. Biological Supply Co. 1176 Mt. Hope Ave., Rochester 20. N. Y.

ILLUSTRATED Catalog: Chemistry, mineralogy, biology 10c. Tracey Laboratories. Evanston. Illinois.

SAVE Money! Supplies Catalog 15c, refundable. Laboratory Sales. Box 161-B. Brighton. Mass.

42 HELP WANTED

ALASKA—Last American Frontier. $1.00 brings 1952 Business Directory, Government Map, Construction Projects Military & Civilian, Homestead & Highway facts, Hunting-Fishing-Game Rules, Mining, Aviation, List of firms hiring, How-When-Where to apply. Alaska Opportunist. P. O. Box 883-S. Hollywood 28. California.

FOREIGN & Latin American Employment 1952 "Foreign Service Directory" gives Up-To-Minute Facts on Military & Civilian Construction, Government Jobs, Major Oil Listings, Aviation, Transportation, Steamship Lines, Mining, Importers, Exporters, How-When-Where to apply, application forms, Hot List Firms Hiring. $1.00 post-paid. Global Reports. P.O. Box 883-S. Hollywood 28. Calif.

FOREIGN Employment Construction men, building trades, helpers, office men, others, interested in Foreign Projects. High wages, quarters, trans. Listings of firms actively working on U. S., Foreign, Intercontinental Projects. Send $1 for Foreign Construction Compendium and Application Forms. Foreign Service Bureau. Dept. PS-2. Box 295. Metuchen. New Jersey. (Not an employment agency—no fees.)

$1,000,000 CONSTRUCTION Projects. "World Wide" printed Monthly Foreign & Domestic employment. Free application blanks tells How-When-Where to apply. $1.00 complete. Global Reports. P.O. Box 883-PX. Hollywood 28. California.

CONSTRUCTION Job List. Published Monthly. $1.00. Dempster's Construction Scout News. Dept. 268-DG. Bridgeport. Ill.

HONOLULU Help Wanted columns airmailed $1.00. Pomeroy's. #3 Campbell Block. Honolulu. Hawaii.

43 AGENTS WANTED

NEW Jobs open in selling! Send name, address for five free issues of Opportunity Magazine's money-making guide, listing hundreds of companies who'll pay you well, full or part-time. No experience needed. Opportunity. 28 E. Jackson. Dept. 18. Chicago 4. Illinois.

NEED Extra Cash? Take orders for personal initialed belts and buckles, cap badges, tie holders, etc. Choice of 3000 emblems. Free sales kit. Hook-Fast. Dept. 1425PS. Providence. R. I.

DRESSES 18c; Coats $2.00; Blouses 35c; Free Catalogue; Crown. 164-PB. Monroe Street. New York 2.

SCHOOL Seniors! A postal will bring you our wonder, Kwick-Sell Cardalog of popular Graduation Name Cards. Biggest profits! Only firm giving free Golden Memory Book and Souvenir Chest. Don't miss out. Hurry that postal! Craftcards. Box 235 (m). Pittsburgh 30. Pa.

START Your Own Business on credit. Always your own boss. 1,437 Dealers sold $5,000 to $28,500 in 1950; their average $6,704. We supply stocks, equipment on credit. 200 home necessities. Selling experience unnecessary to start. Wonderful opportunity to own pleasant, profitable business backed by world-wide industry. Write Rawleigh's. Dept. B-U-PSC. Freeport. Ill.

COMMERCIAL Deep Frying Course. Mock Chicken Legs, Potatoes. New and proven methods. Learn about this money-making field. $2.50. PP. Concession. Toledo 13. Ohio.

NEED Money $50-$100 and more is yours—easily, pleasantly, quickly. In spare time just show friends irresistible Elmira assortments of all-occasion greeting cards, wrappings, personalized stationery, napkins, matches, many other exclusive, profitable specialties. No investment. No experience. Success assured. Bonus. Special Prizes. Promptest Service. Write Today. Free samples, assortments on approval. Elmira Greeting Card Co., Elmira 114. N. Y.

ANYONE can sell Hoover DuPont Nylon Uniforms for beauty shops, waitresses, doctors, nurses, others. In white and colors. Exclusive styles. Top quality. Low priced. Exceptional income. Real future. Equipment free. Write fully. Hoover. Dept. B-101. New York 11. N. Y.

POPULAR SCIENCE OPPORTUNITIES

WHERE to Buy 800,000 articles direct from Manufacturers. Save by buying direct. Sent Free. "Your Profits Under The Spotlight." Glass Pub. Co., Ellwood City 4, Pennsylvania.

JUST Out! New Thrilling sensation in Everyday Cards. Rich foils, satins, velours sell on sight. 21 for $1. Make up to 100% profit. 50 Assortments, Imprint Stationery and Book Matches, Gift Items. Two $1 Assortments on approval. Imprints Free! Joy Greetings, 507 N. Cardinal, Dept. R-61, St. Louis, Missouri.

SELL Sunshine Exclusive Everyday Cards and make Big Money the easy friendly Sunshine way. Complete selection greeting cards, stationery, gift wraps, novelties, etc. 21 DeLuxe Miniature Everyday cards —75c. Many others. Send postcard today for your Sunshine Sample Kit on approval to: Sunshine Art Studios, Dept. PS-2, 115 Fulton St., New York 38, New York.

A Penny Postcard Can Put You In Business. Complete line, Leather jackets, 151 shoe styles. Big commissions. No experience, no investment. Send penny post card for Free outfit. Consolidated Shoe System, Dept. CI-103 Chippewa Falls, Wisc.

BIG Daily Profits—selling embroidered wool and cotton uniforms, initialed buckles, belts, badges, choice 3,000 emblems. Free sales kit. Hook-Fast, Box 480PS, Roanoke, Va.

NEW "Sponge" Wall Cleaner. Erases dirt like magic. Wallpaper, painted walls, ceilings. Saves redecorating. Lightning seller. Samples sent on trial. Kristee 142, Akron, Ohio.

NEED extra money? Show your friends Wonderful Regal line of All-Occasion Greeting Cards. Over 100 beautiful assortments to choose from. Also Exclusive Stationery unobtainable elsewhere. No experience necessary. Your profit up to 100% plus bonus. Write for free samples. Sales kit on approval. Regal Greeting Card Co., Dept. 84, Ferndale, Michigan.

AT Last! Something New and Sensational in Everyday Cards. 21 for $1. Make Extra Money Fast! Show Satin, Velour, Metallic Cards. Get orders easy. Big line $1 Assortments, Scented Stationery, Personal Matches, Kiddie Books, Imprints Free. Two $1 boxes On Approval. Puro Co., 2801 Locust, Dept. 241-B, St. Louis 3, Mo.

MAKE Money Calling On Friends. Show nationally advertised Greeting Cards—new All-Occasion Assortment and laugh-packed Barrel-of-Fun. Also sensational Pinafores & Parasols Personal Notes. All three dollar sellers. Up to 50c profit for you. Big line, includes Gift Wrappings, Stationery, Gift Items, etc. Get Three assortments on approval. Write Wallace Brown, 225 Fifth Ave., Dept. H-4, New York 10.

FAST sellers. Big demand. Catalog. Parker Drug Co., Hoboken 6, New Jersey.

BARGAINS—Terrific Savings—Job Lots —Close-outs! Also save up to 50% on complete lines of Drygoods, Clothing, Hosiery, Notions, Drug Sundries, Toiletries, Novelties, Gifts, Jewelry, Television, etc. 2000 items. Send 25c for Illustrated Wholesale Bargain Catalog, Close-out Flyers, and Special "Get-Acquainted" offer. Valuable merchandise certificate (worth many times 25c) included Free. Reliable Jobbers, 311-J North Desplaines, Chicago 6.

NEW! It's Hot. Retails 39c. Big Profit. National Sales and Service, Greenville, Pa.

MAKE money selling ties. Free catalog. Write to Philip's Neckwear, Dept. 905, 20 West 22 St., New York.

ULTRA-Blue Stock Signs—7c, sell 50c. 2000 slogans, 7" x 11", comedy, religious, general. 15 samples, $1.00. Lowy, 812 Broadway, Dept. 650, New York 3.

CALENDARS, Advertising Novelties, Matches, All styles, including Religious, Varnished, 12 Sheet, Girls. Hundreds of Advertising Novelties. Book Matches, etc. Fleming Calendar Co., 6539 Cottage Grove, Chicago 37, Illinois.

MAKE Wedding Profits. Sell invitations, napkins, matches. Samples free. Dunbar's, Middlebush 5, N. J.

MAN to earn $90 week up. Long needed invention. Advertised Saturday Evening Post, Colliers. Prospects everywhere. Full or part time. Exclusive. No investment. Free samples. Write Red Comet, Inc., Dept. 15-B, Littleton, Colorado.

MAKE Money Fast—Sell big value Greeting Cards. Four new 21 card $1.00 All-Occasion Assortments, Birthday, Easter, Novelty cards, Gift Wrappings, Stationery, Notes, Unusual Gift Items. Over 100 fast-sellers. Amazing profits. Write for Samples on Approval and "Get-Started" Plan. Hedenkamp, 361 Broadway, Dept. PS-15, New York.

WANT to make real money? You can positively make $50.00 a day and up selling a brand new item going to every type of Food and Beverage Store, Factories, Laboratories, Hospitals, etc. First time advertised. Samples furnished. Utility Durawear, 53 West Jackson Blvd., Dept. PS-02, Chicago 4, Illinois.

BRAND-New Sport Shirts 50c Each and amazing money-making opportunity for you! Take orders for world's finest uniforms and work clothes. Sell to garages, service stations, factories! Earn huge profits, get new sport shirts at 50c! Write for thrilling details. Free outfit. Topps, Dept. 542, Rochester, Indiana.

SELL Amazing Value Greeting Cards—for less than 5c each. Show friends, neighbors gorgeous box assortments. Experience unnecessary. Big profits. Bonus. Surprise Gift Offers. Request Feature All-Occasion Assortments on approval. Free samples Name Imprinted Stationery, Napkins, Towels and Free Catalog. New England Art Publishers, North Abington 605-D, Mass.

MAGIC words give you daily cash! "Kendex nylons are free unless satisfactory". New style 300 only 98c including your commission, bonus and postage. If these wonderful sheer DuPont nylon stockings run, snag or are not satisfactory within 1½ months of receipt, we refund the full 98c so they will cost nothing! What woman will hesitate to wear fine nylons at our risk? Just write orders. We deliver and collect. Advance cash plus huge bonus. Spare or full time. No experience necessary. Postcard brings you sample stocking and money-making outfit free and prepaid. No obligation. Kendex Corporation, Babylon 54, N. Y.

ABSOLUTELY Free! Big package actual sample fabrics and style presentation of dresses, lingerie, hosiery, etc. Take orders. Commissions big. Send no money. Melville Co., Dept. 6705, Cincinnati 25, Ohio.

GOLD Lacquered and Silver Sign Letters. Windows. Doors. Trucks. Standard sizes. Penny each. Free samples. Atlas-G, 544 West 79th, Chicago 20.

STOP oil pumping! Restore compression! 200,000 mile guarantee! Only $3.00. Nerlind, Box 7, Inglewood, Calif.

DO You Need Money? $40.00 is yours for selling only 50 boxes of our 300 Greeting Card line. And this can be done in a single day. Free samples. Other leading boxes on approval. Many surprise items. Experience unnecessary. Free samples Personalized Stationery, Napkins. Write today. It costs you nothing to try. Cheerful Card Co., 465 White Plains, New York.

MEXICAN feather pictures. Sell on sight; 200% profit! Free details; sample 10c stamps. Sylvia-SU, Apartado 9036, Mexico City.

BUY wholesale 25,000 items, catalogue 25c. Matthews, 1472-A7, Broadway, N.Y.C.

MEN! You can make a fortune if you join us now. We are introducing Kantlash, Greatest fishing equipment accessory ever manufactured. Sales already pouring in. We want distributors immediately! Retails $2.95. Big, easy profits. Write today! Kantlash, Evanston 8, Illinois.

BIG Profits In Spare Time! I'll send Free Assortment Full-Size Samples fine Foods, Household Necessities to ambitious Men-Women who need money, Friends, neighbors buy eagerly. Send no money. Just write Blair, Dept. 55HB, Lynchburg, Va.

SALESMEN—Put yourself in line for big money, real future. Keep stores supplied with self-selling 5c-$1 carded merchandise. Nationally advertised. Top profits for you and merchants. Liberal deals boost sales. Sideline or full time. World's Products, Dept. 83-G, Spencer, Indiana.

MAKE money like magic. Commissions, bonus to $5.00 pair. Sensational exclusive cushioned shoes, dress, sport, work. Paratroops, Cordovans, Bolo, Swank. No experience or investment. Free outfit. Samples. Paragon Shoes, 713 Columbus, Boston.

STRANGE "Dry" Window Cleaner. Sells like wild. Replaces messy rags, liquids. Simply glide over glass. Samples sent on trial. Kristee 143, Akron, Ohio.

I NEED 500 men to wear sample suits and earn up to $15.00 in a day showing friends and taking orders. Write for details. Progress Tailoring Co., 500 S. Throop St., Dept. C-221, Chicago 7, Ill.

HUGE Profits. Assemble Rhinestone and Pearl Jewelry. Sample Brooch & Earring Kit $1.79. Easily completed in 10 minutes. Sells for $6.50. Giant Kit—Makes $17 worth of jewelry only $3.79. Huge 70 page profit idea packed wholesale catalog 20c. House of Hobbies, Dept. 790-E, Evanston, Ill.

AGENTS—300% profit selling genuine gold window letters; stores and offices. Free samples. Metallic Letter Co., 437 N. Clark, Chicago.

AMAZING discovery. Master Glaze puts brilliant glass-like surface on cars. Free sample, information. Big commissions. Master Glaze, Dept. 736, 7720 Harwood, Milwaukee, Wisconsin.

BIG money career selling exclusive guaranteed, sanforized, fast color uniforms $3.98 up. Nylons, cottons. Sell beauticians, nurses, waitresses, etc. Full, part time—constant demand. Experience unnecessary. Free outfit. Upland Uniforms, 208 East 23rd, Dept. H-5, New York.

FREE Samples, and amazing plan giving you gorgeous Dress without penny cost. Rush name today, with dress size. Harford, Dept. G-235, Cincinnati 25, Ohio.

SELL $2 Fire Extinguishers. Locally. Mailorder. Lorrac, Box 1086S, Albany 1, N. Y.

PART Time Salespeople—Men and Women. Daily Cash returns showing Artmoore Products, three "in demand" items. No investment in stock. Liberal No Risk Starting Offer. Write Dept. C-2, Artmoore, 1319 North Third, Milwaukee, Wis.

AMAZING Miracle Auto Polish—Plastone! New scientific discovery contains pure Carnauba Wax, Genuine Plastic plus Silicones! Sensational money maker! Nationally advertised! Sold by leading firms. Used by America's largest organizations. Only $1 retail. 100% profits. Sales experience unnecessary. Exceptionally easy sales. High repeat sales. Choice protected territories. Once in a life time opportunity for large steady earnings. Only limited number of agents accepted. Write Today. Plastone Company, 2950 W. Grand, Dept. PS-1, Chicago 12, Illinois.

CALIFORNIA sweet smelling beads, sensational sellers. Particulars free. Mission, 2328P West Pico, Los Angeles 6, Calif.

JOBBER-Dealers, Power mowers. Prepaid. Extra profit. City-County. Rotacut-PS, Excelsior Springs, Missouri.

MAKE money introducing world's cutest children's dresses. Big selection adorable styles. Low prices. Complete display free. Rush name. Harford, Dept. G3341, Cincinnati 25, Ohio.

WIN Suits and Earn Money! Both easy with amazing plan. Show finest made-to-measure tailoring to friends, neighbors. No experience or investment. Free outfit. Write Pioneer Tailoring, Dept. C-1121, Congress & Throop, Chicago 7, Illinois.

SELL Big Money-Maker to Men and Women. Easy handwork makes fast-selling useful articles. Sample free. Sunmade Company, Brockton 64, Mass.

BE A Money Maker . . . Use your home as magazine headquarters. Liberal commissions. No experience—No capital needed. Everything furnished. Write for Free Catalog. McGregor Magazine Agency, Dept. 510A, Mount Morris, Illinois.

AGENTS—Salesmen! Import your own merchandise make 500% profit. Represent manufacturers make huge commissions. 1952 Copyright trade bulletin $1. Money refunded if dissatisfied. Benko, 246-S Fifth Avenue, New York 1.

SALESMEN, Distributors, fast selling costume jewelry direct from factory. Big picture catalog free. Pickcraft, C-19 Bank, Attleboro, Massachusetts.

ADDRESS Envelopes! Immediate Commissions! Outfit-Instructions, 25c! Hirsch, Spring Valley 3, New York.

BUY Wholesale thousands nationally advertised products at big discount. Sent free "The Wholesale Plan." American Buyers' Service, 629-T Linden, Buffalo, N. Y.

FREE book "505 Odd Successful Businesses." Work Home! Expect something Odd! Pacific-38C, Oceanside, Calif.

NICKEL Silver key checks—Key check stamping Outfits. Catalog free. General Products, 11PS, No. Pearl, Albany, N. Y.

44 HIGH-GRADE SALESMEN

MAKE money showing neighbors how to beautify yards with glorious flowering shrubs and trees. Quick-bearing Dwarf fruit trees; World-Famous Stark Patented Varieties produce abundant harvests champion-quality apples, pears, peaches, other fruits. Even small plots produce fruit for family-use and to sell. Beautiful Sales Kit Free. Stark Bro's, Dept. 30122, Louisiana, Missouri.

MAKE Money with fast-selling Bostonian Shirts, Blouses too. Spare time, full time. Sales Kit Free. Bostonian, 89 Bickford, Dept. M-11, Boston 30, Mass.

RICH Opportunity for Men in their 50's. Healthful, pleasant occupation. No investment needed. 150 of our men made $500 to $3,000 in one month; many just beginners. Heckman made $104 first 2 hours; Crowley made $224 first day; exceptional earnings. Openings available. Write President, Dept. PS-2, Box 711, Fort Worth 1, Texas. (If you live in Canada, write President, P. O. Box 88, Postal Station J, Dept. PS-2, Danforth, Toronto 6, Ontario.)

WRITE 3 Words—Collect $7.65 on 10-second Demonstration to merchants—write on glass with Amazing Magic Crayon—Presto!—5-color advertising message takes fire—glows like brilliant Neon. Three sales daily bring $22.95 profit. Rush postcard for details.—Complete Sales Kit, Free! Maxilume Co., 125 W. Hubbard, Dept. CL-9-B, Chicago 10, Illinois.

ADVERTISING book matches—Cash in on big demand—sell Union Label matches. Cuts for all businesses and political parties—Free powerhouse selling kit—low prices—protection guaranteed on repeat orders—Cash commissions. Superior Match Co., Dept. P-252, 7530 Greenwood, Chicago.

AD Matches! Sell Amazing Designs—20, 30, 40 and 240-light book matches. Biggest spot cash commissions; every business a prospect. Low prices for high quality. Repeats. Start without experience; men, women; full, part time. Buy Nothing! Sales kit furnished. Match Corp., Dept. PS-26 Chicago 32, Illinois.

45 EDUCATIONAL & INSTRUCTION

BOOKKEEPERS! Increase your earnings! Operate your own simplified "Dollar-A-Week" Bookkeeping and Tax Service. Full or spare time. Details Free. No obligation. Ellis, Box 203-B, Cedar Grove, N.C.

PIANO Tuning Pays. Learn this profitable profession at home. Our Tonometer and mechanical aids make learning easy. No knowledge music necessary. Diploma granted. Largest and oldest school—51st year. G. I. Approved. Write for booklet. Niles Bryant School, 77 Bryant Bldg., Washington 16, D. C.

LEARN Piano Tuning, Repairing—at home in 30 days. Unlimited income. Phonograph recordings, tools and instructions furnished. Write Capitol City Tuning School, Department C-233, 129 East Michigan, Lansing 16, Michigan.

EARN more money by improving your mathematics, details free. Page Publications, McFarland, Wisconsin.

GUNSMITHING, learn now! Start earning good income. Our Residence Course is thorough, practical! Approved for qualifying Veterans; easy-pay plan for non-Vets. Part-time work arranged. Write: Pennsylvania Gunsmith School, 1000S Western, Pittsburgh.

PRACTICAL Nursing—Learn Easily at Home. Spare Time. Big demand, good earnings. High School not necessary. Write for free facts. Wayne School, Dept. FH-7, 2525 Sheffield, Chicago 14, Ill.

HIGH School—No Classes. Study at home. Spare time. Diploma awarded. Write for Free catalog. HBA-9, Wayne School, 2527 N. Sheffield, Chicago 14, Ill.

USED Correspondence Courses and Books sold and rented. Money back guarantee. Catalog free. (Courses Bought.) Lee Mountain, Pisgah, Alabama.

MIDLAND Linotype School, Charles City, Iowa. Civilian, Veteran courses. Free placement.

START a Collection Agency business. Very profitable. Quickly learned. Write Cole & Associates, Syracuse 2, N. Y.

TIRED Of No Money, second rate jobs? Like to start a real career with a lifetime of high salaries? Write me about two growing fields that really need men. Ed. Howes, Chief, National Schools, 4000 S. Figueroa Street, Los Angeles 37.

BECOME a Doctor of Psychology or Metaphysics. Teach secret of contentment, happiness. Win degree of PsD, or MsD. Solve mental worries. Free book. College of Universal Truth, 5153-K N. Clark, Chicago.

FREE "Career Chart". Write Professor Martin, Williamsburg, Michigan. Mention occupation.

WELDING training pays at Hobart Welding School. Box P-222, Troy, Ohio. VA Contract. Best equipment. Catalog Free.

BARTENDING and Management, Home or School training. American Bartending School, P-334 S. Wabash, Chicago 4, Ill.

USED Correspondence Courses bought and sold. Free list. Walsh, 894 Main, Buffalo 2, New York.

MEDICAL Laboratory Technicians in great demand. We train you in your own home. Catalogue free. Imperial Technical Institute, Box 973-B, Austin, Texas.

YOU can learn upholstering at home. Big opportunities! Write for Free literature. National Upholstery Institute, 6108 East 24th, Indianapolis.

INCREDIBLE! Unprecedented! Look under "Personal!" Bijou, Box 1727-VM, Hollywood 28, Calif.

"HANDBOOK of Psychological Law" shows how you can better understand yourself and others. Gives basic laws governing human character, and shows how to understand nearly any personality trait in the light of its cause. Satisfaction Guaranteed. Only 50c. Northwestern Printing Co., 314 W. Leonard St., Grand Rapids 4, Michigan.

USED Correspondence Courses and Educational Books Bought, Sold, Rented. Catalog Free. Educational Exchange, Summerville, Georgia.

WHY die? Look under "Personal!" Bijou, Box V-1727, Hollywood 28, Calif.

46 CONTESTS

AMERICAN Puzzle Tiebreakers New D.A.V. News Systems Books Services. Turlot, POB 1221, Chicago 90, Ill.

TIE-Breaker picture puzzles exposed. $1.00. Winograd, Box 1495, Philadelphia 5, Penna.

$1000 WON by client. Contest Service, United, 13 Earl, Red Bank, N. J.

47 DETECTIVES

DETECTIVE Training. Phillips Secret Service System, 1917-C North Kenneth, Chicago 39, Ill.

DETECTIVES—Work home—Travel. Experience unnecessary. Detective Particulars free. Write Wagoner, P-125 West 86th, New York 24.

DETECTIVES needed in every town. Hanna, 8118 Fielding, Tampa, Florida.

48 LANGUAGE OUTFITS

LISTEN And Learn A Language by Linguaphone. At home, quickly, easily, correctly master Spanish, French, German, Russian, Asiatic—any of 29 languages through Linguaphone Conversational Method. Add to Armed Services job, travel opportunities. Send for Free book. Approved for Veterans' Training. Linguaphone Institute, 5402, Radio City, N.Y.C.

50 BUSINESS SERVICE, INFORMATION, NAME LISTS

MAILING Lists. All kinds 1000 $5.00. Dixie Service, King, N. Carolina.

MAILING Lists 1,000, $5.00. Alex Palazzo, 32-07 70th Terrace, Jackson Heights, New York.

GUARANTEED Fresh names compiled daily, mailorder buyers, opportunity seekers, etc. Thousand $4.00, trial 300, $1.00. Wright Publications, 2276 Hubbard, Memphis 8, Tennessee.

51 SPECIAL SERVICES

FINE dividends? Double $200 or more? Write Investment Data, Alanson, Mich.

SAN FRANCISCO—Pretend you're here! Your mail handled both ways $3.00 month; TBSCO., 742 Market St., San Francisco.

52 AUTHORS SERVICE

I Want New Writers. Experience unnecessary. Earn at home, spare time. Details Free. Saunders M. Cummings, 468-15 Independence Bldg., Colorado Springs, Colo.

53 ADVERTISING

24 WORDS in 50 Weeklies, $4.96. H. J. Darnell, 730 Hays, Jackson, Tennessee.

ADVERTISE; 24 words, 40 Newspapers, $3.50. Lists Free. Advertising Bureau, 10511-P Springfield, Chicago 43.

20 WORDS 100 Weeklies $6.00. York Agencies, Quebec City, Canada.

54 CARTOONING, SIGN PAINTING, CHALK TALKS

"HOW To Make Money With Simple Cartoons"—A book everyone who likes to draw should have. It is free; no obligation. Simply address Cartoonists' Exchange, Dept. 192-C, Pleasant Hill, Ohio.

LEARN Cartooning, Illustrating, Portrait Drawing, Showcard Writing, etc., quickly with our new, easy methods. Catalog Free. National Artists, 801 North Marsalis, C-2, Dallas 3, Texas.

LEARN Sign Painting at Home. Test Lesson Free. Ben Kerns, Box 812-PS, Greenville, South Carolina.

CHALK Talks. Laugh Producing Program. $1.00. Illustrated Catalog 10c. Cartoonist Balda, Oshkosh, Wisconsin.

55 TYPEWRITERS & OFFICE MACHINES

TYPEWRITERS $22.50. Adders, Duplicators, $13.50. Typewriters, 118 Spruce, Wichita 7, Kansas.

ADDING machines, typewriters, new portables, office size typewriters wholesale. Enclose 10c for catalogues. Apple, 993A Westchester Ave., New York City 59.

TYPEWRITERS, Printing Devices, Office Machines supplies appliances. Dixie Graph, King, N. Carolina.

57 PRINTING, MULTIGRAPHING, ETC.

1,000 BUSINESS cards $2.35. Prepaid. Other printing. W. Dornfeld, Iron Ridge 6, Wisconsin.

1000 BUSINESS Cards $2.50 Prepaid samples Free. Reliable Print Shop 905 East Jefferson, Louisville 6 Ky.

QUALITY Printing, Stationery, circulars, booklets, publications. Free catalog. Adams, 30 West Washington, Chicago 2, Ill.

500 LETTERHEADS, 500 Envelopes, $7.58. Hammermill. Lowest prices in USA. Jobbers. Box 31-PS, Girard, Kansas.

BUSINESS Printing. Samples, prices free. Howprint, 723-S Eunice, Webster Groves 19, Missouri.

5000 $6\frac{3}{4}$ ENVELOPES printed $3.10 per thousand. 1000 Embossed business cards $4.25. Samples free. Michel, Box 76E, New York 16.

FREE Samples, prices. Quality work postpaid. Fast service. Sutton Printing, Box 853-S, Waycross, Georgia.

REALLY Distinctive Business Cards. Save money. Make favorable impression. Samples. Mention business. Stamp appreciated. Roscoe Heavenser, Colmar, Penna.

PRINT Without A Printing Press. Big Money! See page 71.

MILITARY Stationery Name, insignia, processed gold, large box $1.95 cash. Wainwright, Dolgeville, New York.

100 $8\frac{1}{2}$x11 LETTERHEADS $1.00 Postpaid. Envelopes same. Race Printing, Hudson, New York.

58 PRINTING OUTFITS, SUPPLIES

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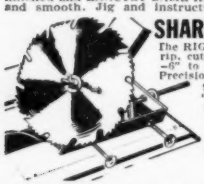

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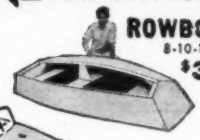

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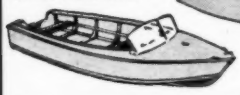

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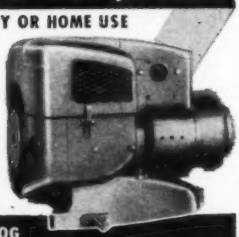

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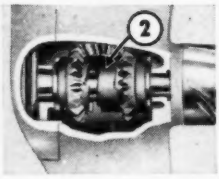

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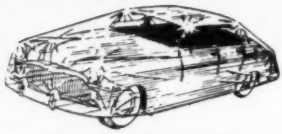

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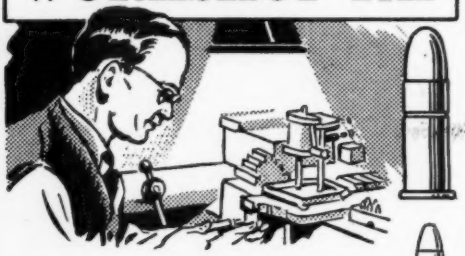

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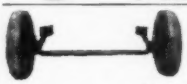

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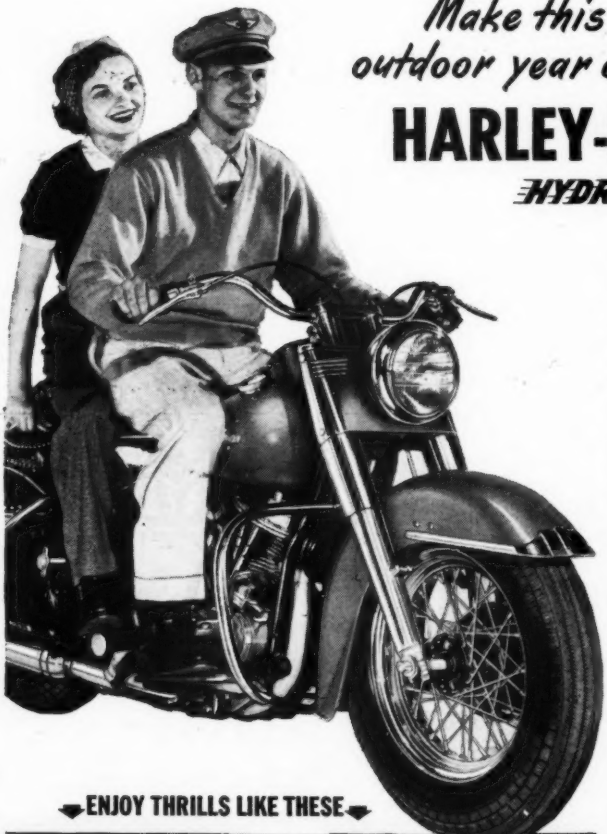

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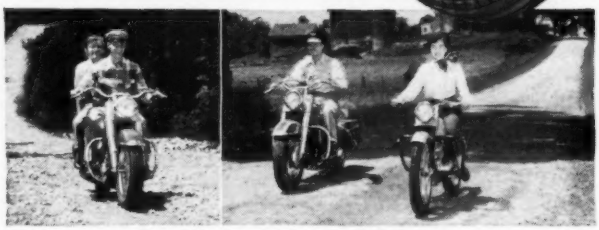

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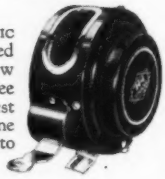

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On location in Florida, Gary Cooper makes the 8-mile trip into the Everglades with a Sea-Horse 25 —the outboard motor that modernizes water travel everywhere.

Here is DEPENDable, low-cost power for modern water transportation. Speeds over 30 mph — in a motor so beautifully engineered it *trolls!* Less than 4 lbs. per hp.! A brute for rough going and heavy loads, yet as easy to handle as a "5"! Features? The latest and the best: Gear Shift, Synchro Twist-Grip Speed Control, Mile-Master Fuel Tank with Ful-Vue Fuel Gauge. Adaptable to full remote control. Best of all, Johnson's big production makes this great motor available at only $390*. See your Johnson Dealer. Look for his name under "Outboard Motors" in your classified phone book.

FREE! New Handy Chart. Describes the 4 great '52 models, including the *all-new* Sea-Horse 3. Write!

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SEA-HORSE 3 — 3 H.P. Less than 30 lbs.! Amazing new Johnson Angle-matic Drive **$145.00***

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*All hp ratings OBC Certified brake hp at 4000 rpm. *All prices f.o.b. factory. Subject to change without notice.*

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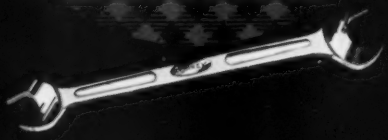
It is an inborn trait. The real mechanic thinks precisely. His materials and equipment must be flawless. He makes no compromise with quality in tools. He applauds perfection in the work of other artisans.

Pride in perfection. That is the reason Bonney wrenches are America's finest —unmatched for lightness, strength, balance, and precision.

Bonney wrenches are the pride of the men who make them . . . the pride of the men who use them.

BONNEY FORGE & TOOL WORKS
Allentown, Pennsylvania

BONNEY TOOLS



Pride in perfection is exemplified in the precision ball and roller bearings produced by leading bearings manufacturers such as SKF, Timken, Fafnir, BCA, and Norma-Hoffmann.

POPULAR SCIENCE
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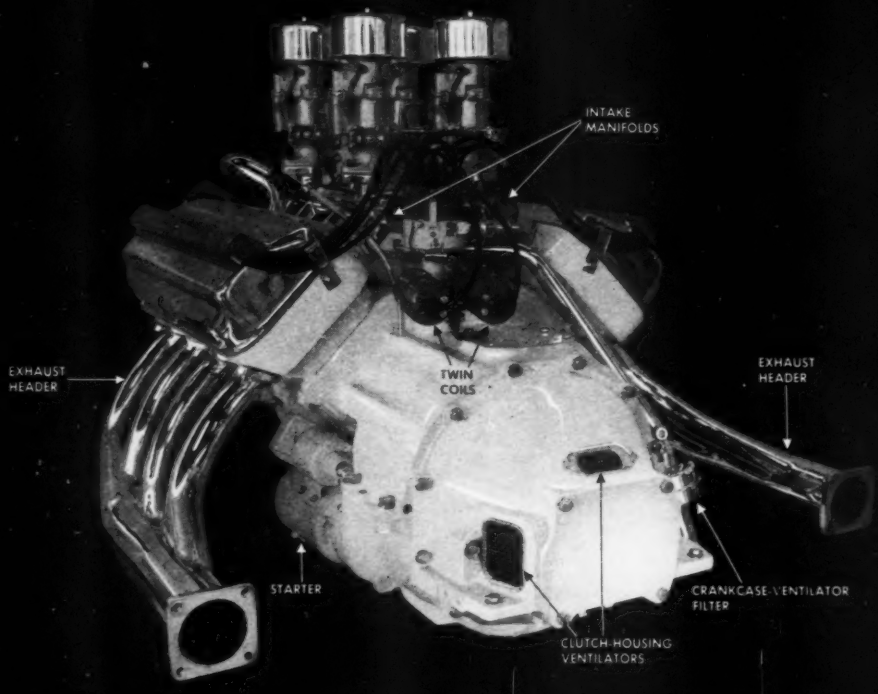
Chrysler Unveils Dream Sports Car

You can't buy it yet, but this 310-hp. luxury job may go on a production line.

A MAN walked into the Chrysler Corp. general offices in Detroit the other day and said, "I'll give you $100,000 for that car." He meant it. He could pay it.

The car he wanted was Chrysler's K-310, newest of the fancy-pants, experimental, European-type sports jobs to be exhibited



ENGINE IN K-310 is basically Chrysler's hemispherical-head V-8, but original 180 hp. has been raised to 310 at 5,200 r.p.m. Changes that help add power include four carburetors for better breathing, a dual exhaust system, bigger valves, valve timing that permits more overlap, mechanical valve tappets, second coil for better high-speed ignition.

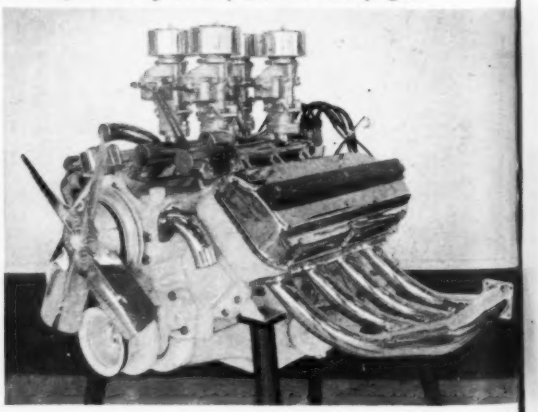
in the U. S. The engine is Chrysler's hemispherical-head V-8, souped up to 310 horsepower. The frame and transmission are also Chrysler's. But the body was hand-built in Italy by the Ghia Co. of Turin (PS, Jan. '52, p. 88).

The man with the $100,000 couldn't buy the car. It's one of a kind. But some day he may get a duplicate. No decision has been reached, but Chrysler won't deny it is fiddling with the idea of putting the K-310 on a production line.

Sometime this spring, engineers will begin road testing the car after it has completed its current exhibition tour of major cities. One thing they want to know is what that powerful engine will do in a car. They'll also try out a lot of fancy accessories.

On the basis of the engineers' tests, an important decision will be made—whether to give buyers a chance at a production-model K-310.

SUPER ENGINE was displayed like this when Chrysler first exhibited the K-310, but it is now in the car. Its cylinder displacement is same as standard V-8, 331 cubic inches. Compression was raised from 7.5:1 to 8.1:1, but engine uses presently available Ethyl gas.



GRAB HANDLE on instrument panel is typical of European sports cars. Panel also has a tachometer—at driver's left. For road testing, car will be equipped with power steering, electric window lifts and seat adjusters, and a mechanical steering-wheel adjustment.

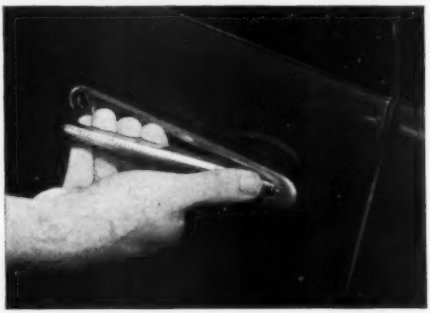
YOU PULL HANDLE beside rear seat—there's one on each side—to open spring-hinged trunk lid. Body of K-310 is all steel, but any production model would include some aluminum to cut weight. Outside guesses as to price of production car: $8,000 to $12,000.

WHEN YOU TILT SEAT, special linkage moves it forward for more entrance room. Seat is divided off center. Car is 220½ in. long, 59 in. high, has 125½-in. wheelbase, weighs just under 4,400 lb. It seats six comfortably.

WHEEL DESIGN ON DECK is strictly ornamental. Pedestal units on fenders include turn signals, tail and stop lights. Since this photo was taken, twin tailpipes have been installed.

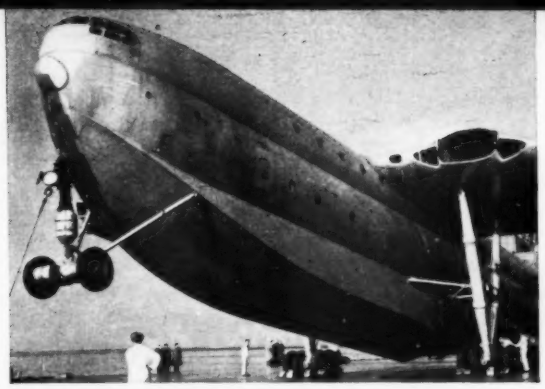
For more details of the K-310 see following page.

WIRE WHEELS of K-310 look like racing knock-off type, but are actually mounted with acorn nuts. Open spokes allow better air circulation around disk-type brakes. Wheels of large diameter were used to carry out European lines, give 7¾-inch road clearance.



DOOR HANDLES are flush with body. Thumb pushes out latch so fingers can get behind it. Body of K-310 is blue, wheel-hub centers are gold, and inside trim is gray and light blue.

SPARE WHEEL lies flat to give more luggage space. Because wheel and tire weigh 66 pounds, a spring-hinged bracket is provided for easier removal. Wheel rises and swings out when you remove retaining nuts. A polished steel panel holds the license plate. END



RAF Gets 10-Engine Transport

THE Princess, newest British troop carrier, will fly 200 men nonstop for a distance of 3,500 miles. Ten turboprop engines power the 146-foot-long, double-deck hull. To get the 140-ton flying boat out of its hangar, the tail had to be lowered and the nose raised as shown in the photo above.

Rockets Added to Scorpion

THE Air Force is testing a Scorpion that packs more poison—the Northrop F-89D. The twin-jet, all-weather interceptor-fighter totes rockets so lethal a single hit means curtains for the biggest bomber. It follows the design of the standard F-89 but carries electronic aiming devices and automatic triggering equipment for pinpoint rocket hits. A long-range plane, it does better than 700 m.p.h. Air pressure inside the cockpit changes automatically with altitude.

"Most Powerful" Jets Push Britain's Delta-Wing Fighter

THE British conception of a twin-jet, long-range interceptor-fighter of formidable power—the GA 5—is shown at left. It is just off the secret list and performance details are scarce. Delta-winged and radar-equipped, it is fitted with Sapphire jet engines, claimed to be the most powerful made. The plane can serve in all weather, day or night.

What's New

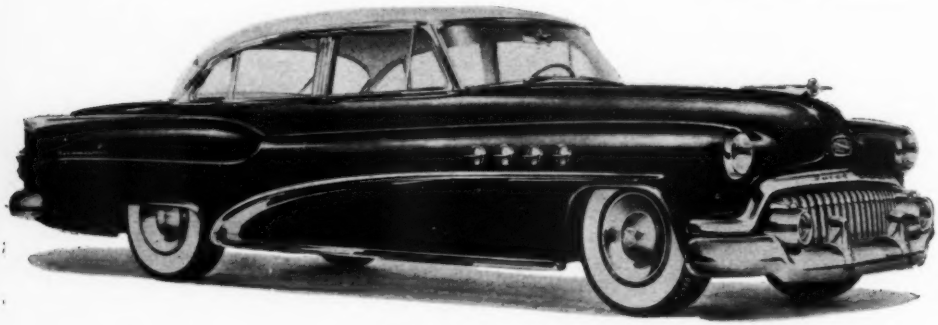
POPULAR SCIENCE this month presents its own automobile show, featuring ten 1952 models that were unveiled in January. They range from the least expensive, stripped-down "transportation" to the lushest luxury wagons.

Seven of these cars are pictured here and on the next two pages. Mechanical innovations include a new power-steering unit, a new carburetor and an improved transmission. Stainless steel has been substituted for chrome in some restyling jobs.

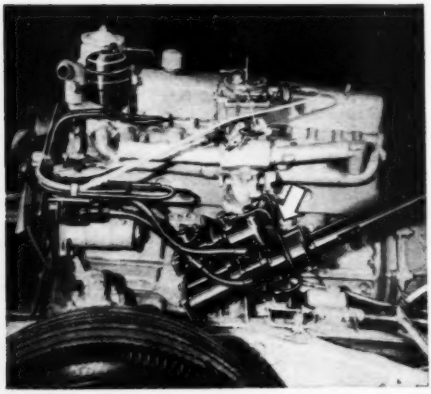
The Lincoln and Mercury, which are new from bumper to bumper, are described on pages 134 and 158 respectively. Wilbur Shaw reports on the Hudson, which has made only styling refinements, on page 122.

Take a good look. This year will be the last for new lines of cars until Uncle Sam ends the freeze on design changes.

—DEVON FRANCIS



BUICK



Power steering appears on Buick for the first time this year. It differs from the one other hydraulically boosted passenger-car unit—Chrysler's—in that the driver gets a feel of resistance from the wheel. Shown at left (arrow), it requires the motorist to compress springs as he turns, giving him the sensation of steering while actually taking three-fourths of the effort out of the job. The steering-wheel ratio—21.3 to 1—is also about the same as that used with manual steering. A new type of carburetor provides a greater flow of fuel and air as the car gains speed. It is actually two carburetors in one, the second unit acting as a booster at high speeds. Styling changes include a new trim line that sweeps from the top of the front fender to the bottom of the rear. A higher "bustle-back" deck lid gives more luggage space.

in '52 Cars?

ALLSTATE The nearest thing to a mail-order automobile is announced by Sears, Roebuck. Basically, the Allstate, as it is called, is the little Henry J produced by Kaiser-Frazer. Some minor changes have reduced the cost of the car. Described as the lowest-priced full-size sedan in the U. S., it will be sold equipped with Allstate tires and batteries through Sears' retail stores. Like the Henry J, it will get 30 to 35 miles per gallon, comes with four or six cylinders.

STUDEBAKER Biggest news about Studebaker is that the company has abandoned the aero-nose design announced two years ago. For 1952, Studebaker hoods are flatter, longer, lower. Grilles and bumpers are wrapped around farther, and changes have been made in the design of the tail lights and trunk-lid handle. Brake-pedal action is improved by a better linkage. Rear brakes now have floating shoes. A five-passenger hard top has been added to the line.

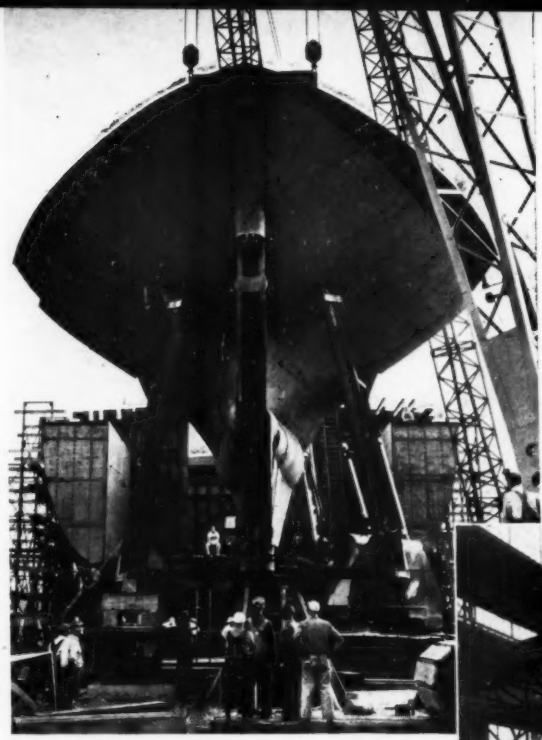
CHEVROLET Engine mounts and shock absorbers are modified in the new Chevrolet to improve dampening of road and mechanical vibration. The carburetor on the car's famous six-cylinder overhead-valve engine has been altered to make the accelerator more responsive to the toe. An automatic choke is added to Powerglide automatic transmission. Grille and front-end ornamentation have been redesigned, and range of body color schemes is wider.

Please turn the page for three more 1952 cars.

PLYMOUTH An improvement in the Oriflow shock absorbers that were first announced a year ago (PS, Feb. '51, p. 98) and a new combustion chamber for the six-cylinder L-head engine characterize the 1952 Plymouth. The new head not only gives the motorist better gas mileage but adds to the snap of the engine as well. Some minor styling modifications have also been made.

OLDSMOBILE The trend toward emphasis on hard tops is evident in the 98 series of Oldsmobiles. The car pictured above, the Olds Holiday Coupe, has new rear-deck styling to accentuate the long, low look of this series. The 160-hp. engine is equipped with the new carburetor that is being featured by Buick. Hydraulic steering is optional. The Hydra-Matic unit is improved.

CADILLAC The most powerful passenger-car engine made in this country was announced for the golden-anniversary Cadillac. Of 190 horsepower, it is basically Cadillac's famous V-8, but valving and exhaust system have undergone redesign. In approved hot-rod style, each bank of cylinders has its own exhaust manifold, and there are dual mufflers and dual exhaust pipes. A new carburetor is standard equipment, power steering and Dual-Range Hydra-Matic optional.



BIGGEST PREFAB SECTION of ship was 126-ton stern, shown above being hoisted into place.

Prefab Freighter to Haul Limestone

You've heard of rowboats built in basements? Here's a freighter, the *John G. Munson*, that was prefabricated indoors. Steel plates were welded into big sections of the ship by giant machines like "Jungle Jim" (below). Later the prefabricated units were riveted together outdoors to form the 666-foot hull. The self-unloading limestone hauler, recently launched (left below), will start its Great Lakes trips this spring.

Tool Like Sandblaster "Drills" Teeth, Doesn't Hurt—They Say

A high-pressure jet of abrasive powder is replacing drills and burrs in some dentists' offices. The instrument cuts into a tooth cavity in the same way a sandblaster skims off the face of a stone building. But instead of sand, it spurts a stream of aluminum oxide driven by pressurized carbon dioxide. A suction attachment removes the abrasive particles from the patient's mouth as the work proceeds.

The new method of cutting cavities eliminates high temperatures and vibration and is said to make "drilling" almost painless. The instrument is made by the S. S. White Dental Mfg. Co., Philadelphia.

Rocketing Doctor Survives Man's Suddenest Stop

NEW WIDE-STRAP HARNESS held Major Stapp to seat of rocket-propelled sled. Accelerometers attached to mouthpiece, chest and knee (above) measured G force during run.

A MAN driving an automobile 60 miles an hour could stop in three feet without suffering a scratch—if he were properly strapped in and the car held together. The U. S. Air Force has proved it.

On the toughest ride any human being ever took voluntarily, a doctor at Edwards Air Force Base in California rode a rocket sled to a stop which inflicted a punishment of 46.6 Gs—more than 46 times the force of gravity.

This was eight more Gs than any man had ever taken and lived to tell about it.

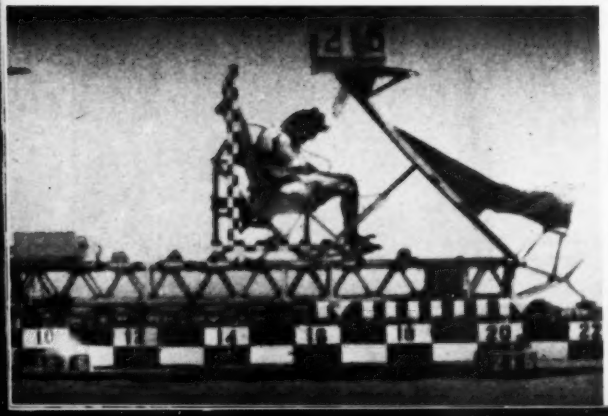
He was decelerated 120 miles an hour in 31 feet. That's equal to a full stop in three feet from 60 miles an hour.

All that saved Maj. John P. Stapp, flight surgeon and project officer at the Aero Medical Laboratory at Wright Field, from serious injury or death was a restraining harness. His abdomen, shoulders, legs, arms and even his feet were strapped to the seat structure.

He rode the same rocket-propelled car described in POPULAR SCIENCE in March, 1950, (p. 152) as a test bed for human deceleration.

From dozens of rides that Major Stapp and 13 other men have taken in the rocket car, the Air Force has gleaned information for the design of a new wide-strap nylon seat harness. It consists of V-shaped leg

SLED HIT BRAKES (left below) at 154.8 m.p.h., slowing to 34.4 m.p.h. in .228 second. Impact of 46.6 Gs (right below) strained Stapp's body fiercely against straps.

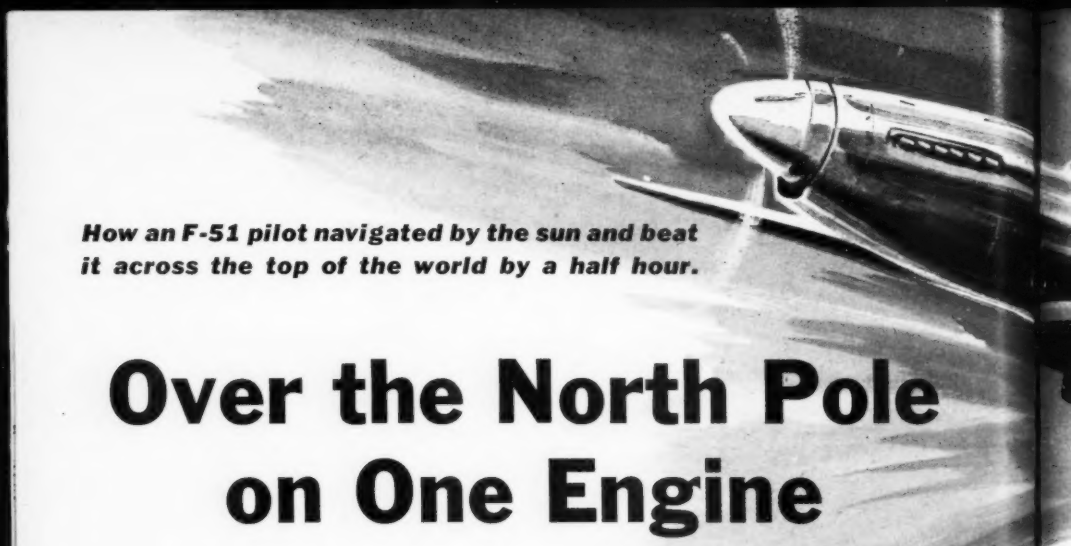


HERE'S WHAT WOULD HAPPEN to an airman in ordinary harness decelerating at 35 Gs. Above: dummy crashes through inch-thick wooden barrier. Right: dummy is *kaput*.

straps and flat shoulder and chest straps.

The harness distributes pressure evenly over the solid structures of shoulders and hips, the portions of the body best suited to carrying loads, thus providing better protection against crash injuries.

The experiments may help in the construction of escape pods, in determining the maximum speeds at which ejection seats can be operated safely, and in setting endurance limits for the shock of parachute openings at high speeds. END



How an F-51 pilot navigated by the sun and beat it across the top of the world by a half hour.

Over the North Pole on One Engine

By Francis and Katharine Drake

ONE sunny day last May, a bareheaded man in tweeds fished a letter from his pocket and posted it. The address was scrawled in pencil: "Santa Claus. North Pole." What made this letter very special was this: after being mailed it spiraled down four miles and landed smack at its destination—the North Pole.

Capt. Charles Blair, streaking across the rooftop of the world in one of the great flights of history, dispatched a thought wave to a small son in faraway New York: "*Operation Santa. Mission Accomplished.*" Blair's second objective—tagged *Operation Suicide* by fellow airmen—was still anybody's guess. High over that shimmering wilderness of ice he was risking his neck to explore a matter of international importance: are the long-hoped-for transpolar flights finally in sight?

Earth Spins Like Football

So far the difficulties of arctic flying have outweighed the advantage of shorter distances. Only very-long-range military planes with special navigating aids, fuel for 10,000 miles, crews of a dozen men, fly across this frozen frontier. At the North Pole the earth spins underneath a plane like a gigantic football. No destination stays put, no magnetic compass registers correctly, no radio can reach the earphones. The floating icecap is in ceaseless turmoil, breaking up; refreezing, cracking again. There is no place to land in safety, and an error of a few degrees can spell the difference between Alaska and Siberia.

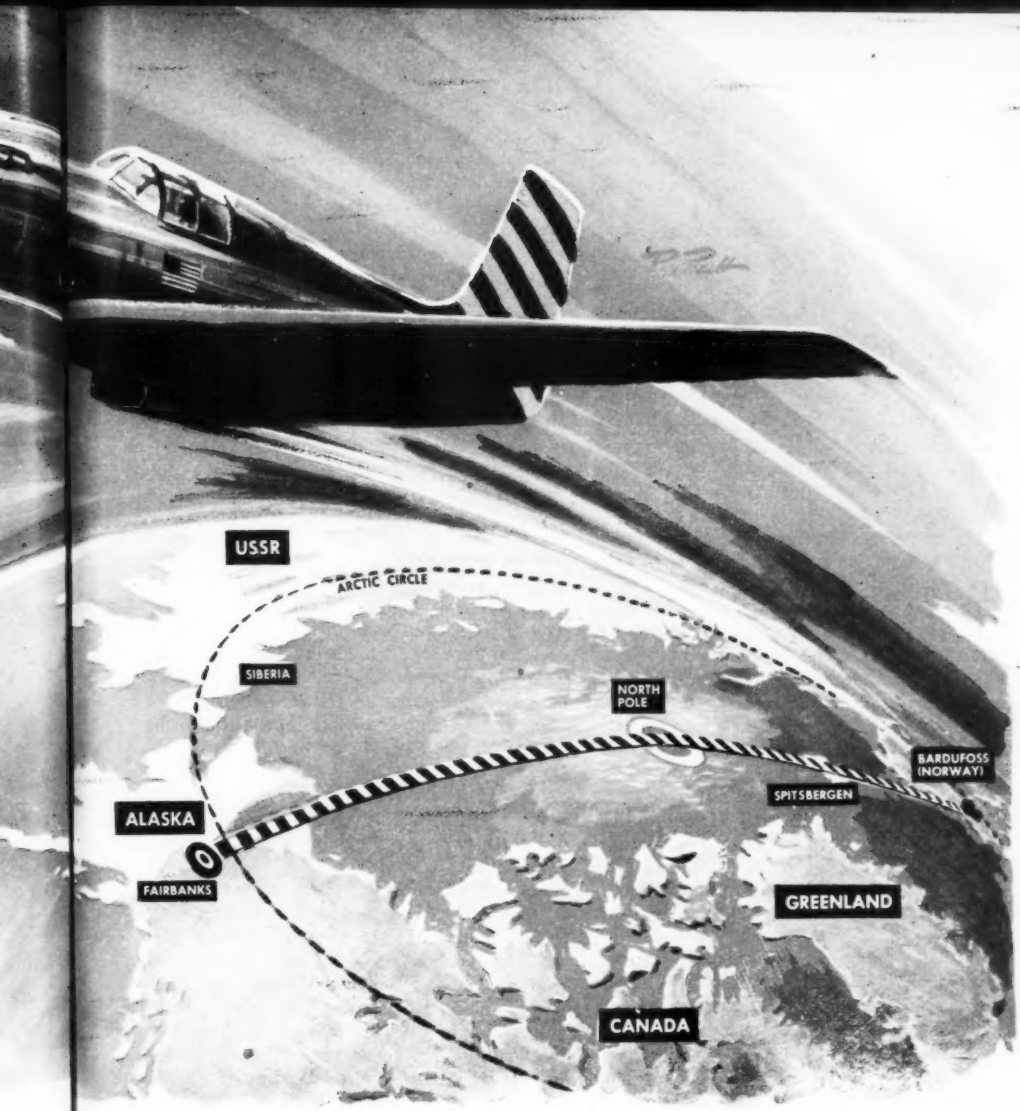
What, then, got into quiet, serious, 40-year-old Charlie Blair to make him march off to the bank one day, draw out his savings and transform himself into a one-man polar expedition? Blair's record marked him the precise opposite of stunt man. He was a master airline captain, with more than 3,000,000 miles and 450 Atlantic crossings in the log.

Headshaking began when Blair bought an Army-surplus Mustang F-51, vintage 1943. It was a museum piece as fighters go, but for the buyer its charm lay in its record. The tiny ship had twice won the Bendix Air Races. It was fast and it was strong—a good plane for a good man.

Flying Gas Tank Is Born

The revamping of this old propeller-driven jalopy into an aerial hot rod capable of distance flying monopolized months of Blair's spare time. But by January, 1951, the Mustang was ready to go places. She had a new 1,700-horsepower Rolls-Royce Merlin engine and a staggering new fuel capacity. She had a new name, too, Excalibur III, but around the hangars she was called "the Flying Gas Tank."

Blair's idea of a warm-up flight provoked more headshaking. He proposed to ride the winter winds from New York to London, 3,479 miles nonstop—*astride a jet stream.* These jet streams are westerly winds of super-hurricane force that boil around the upper stratosphere, reaching a peak of 250



miles an hour or more in winter. Given a wild winter's day, Blair thought, why not combine a shakedown cruise with an exploratory feeler into the speedways of tomorrow?

January 30 provided the right setup and Blair had three days' leave. With the wind barreling down the runways, a temperature near zero and two formidable storms across the route, he lifted Excalibur from Idlewild International Airport and disappeared into an overcast of snow and ice. Seven hours and 48 minutes later he set her down alongside London's sooty chimney stacks. Man and machine between them had shattered every transatlantic speed mark in the book—their record still stands, jets notwithstanding.

Blair traveled faster than any distance flier in history, with an average speed of seven and a half miles per minute. Landing in London with ample fuel reserve convinced the pilot that he had licked Excalibur's distance handicap. There still remained that other obstacle—navigation over the polar icecap.

Today when airmen get together, Blair's

"prepackaged" navigation is still Topic A. It made aviation history and blueprinted a method by which passenger liners may soon be following his trail across the Pole. Using existing principles, he figured out a way of doing the complicated work *beforehand* and boiled down flight procedures to a simple routine.

Ready to "Read" the Sun

First he set a precise day, hour and minute for his take-off. Next, he plotted on a chart his roadway through the sky, a beeline from Bardufoss, Norway, to Fairbanks, Alaska. He chopped it up into hours and established from navigational tables the angle that the sun would make to each of these time intersections at a specific minute. With a fixed take-off time, he could make the sun give him a route marker for almost every mile of the trip.

Getting a sun bearing, or angle, in flight is a simple operation, like looking down the peep sight of a rifle. Blair bought a sun compass, or angle measurer, for $12 and mounted it in the cockpit. He also bought a bubble sextant to help him to determine whether or not the wind was drifting him off course. With these two instruments and a preplotted course, all he would have to do en route would be to read off sun angles and compare them with the corresponding readings on the chart. If they agreed, he was on course. If they did not agree, he would have to yank Excalibur's nose around until they did.

Arctic Gear: a Four-Leaf Clover

Blair selected May for his flight, a time when arctic weather is normally at its best. On May 29 the sun and moon would be almost at right angles at the Pole, a phenomenon which offered opportunity for a navigational double check. He chose Bardufoss, just inside the Arctic Circle, for his departure point. Almost invisible beside a small fjord, it is locked in by spectacular ravines and mountains. Blair landed there at noon on May 29, ceiling unlimited. His schedule called for a take-off at 1500 Greenwich Mean Time.

By 1430 GMT he had checked the plane with Lindbergh-like precision, had set his three watches and reshot the sun. In those remaining minutes, misgivings seized the airport personnel. The picture just refused to add up to a polar exploration—the bareheaded man in tweeds, that tiny plane, daring to challenge the harshest wilderness on earth! Where were the deerskin parkas, the bearskin face rolls, the hareskin stockings cushioned in arctic grass and seal hide; where were the sledges, skis, pickaxes? All Blair had checked aboard was a four-leaf clover, a letter to Santa Claus and the first polar air mail—3,000 postcards to be auctioned off for the Damon Runyon Cancer Fund. *Those Americans!*

The airport clock clicked to 1458 GMT. Blair waved and closed the cockpit cover. 1459 GMT . . . *Zero!* The tires began to roll. It was the heaviest take-off in the history of that arctic hideaway. The only exit lay downwind over the bottom of a gorge, the sides of which towered 5,000 feet. Spectators held their breaths. Faster and faster turned the wheels, straining to outrun that tail wind. One hundred, 120, 130 miles per hour. The tail, glutted with gas, dragged like a meal sack. Out of the corner of one eye, Blair sensed the runway scorching by . . . a third . . . a half . . . The next few seconds would decide. Then, *hallelujah,* up came the tail . . . Now, a bump . . . another . . . and Excalibur was airborne in a photo finish with the ending runway.

A Human Calculating Machine

Blair adjusted his oxygen mask and set up the sun compass. From now on, this was his routine: every 10 minutes take bearing, check with packaged plan, adjust course as necessary to keep astride meridian 20. Every hour double check with sextant. For the rest, watch panel, watch fuel, nurse engine, check oil, check distance run, just keep on being a human calculating machine.

Below, the sea was like plate glass. Beneath its unlined face rotted a thousand unsung polar expeditions. How guileless can you look, Blair wondered, with such an infamous record? As if to answer him, the sea whipped up a mist; in a moment it thickened and climbed up almost to the fuselage.

Date With a Radio Signal

Blair swore a little. At Spitsbergen, the most northerly habitation in the world, he had a date with a radio signal—atmospherics permitting. He crossed his fingers and tried a running fix on Spitsbergen's main tower. Luck was with him. The signal, streaming in high and clear, indicated the island passing a little to the west, just where it should have been. *On course! On time!*

THE FLYING GAS TANK is what Idlewild hangar crews called the souped-up 1943 Army-surplus F-51 that Capt. Charles F. Blair flew over the Pole. It carried 865 gallons of fuel.

AFTER MAILING A LETTER TO SANTA for his son by dropping it on the North Pole, Captain Blair is welcomed home. He was the first to cross the Pole alone in a single-engine plane.

Blair's spirits soared. He switched off the radio. Next call Alaska!

Now he hoisted Excalibur to 22,000 feet, his thriftiest cruising altitude. For nearly an hour he flew on without any sense of progress. Time and distance seemed to count for nothing. He felt like an insect trapped between cloud and firmament. The midnight sun, blazing into the cockpit, made him swelter despite his summer underwear; he might be over Florida, with orange groves beneath the overcast.

Polar Icecap Below

As if to reassure him, the clouds thinned out abruptly. Soon a great, ragged hole appeared, and Blair caught his breath. Below him stretched a sight that men have dreamed about for centuries, but few have seen—the soulless, silver-plated panorama of the polar icecap. In awe, Blair stared down at the floating crust that helmeted the world, the legendary realm without a sunset or a dawn. From four miles up the ice-ocean looked solid as a continent, crisscrossed by "leads" of young ice. Across these treacherous leads, with sleds and huskies, over trackless gray blue hummocks of old ice, had gone the trail blazers, hoping with every mile to find new land, but coming upon nothing but more ice floes.

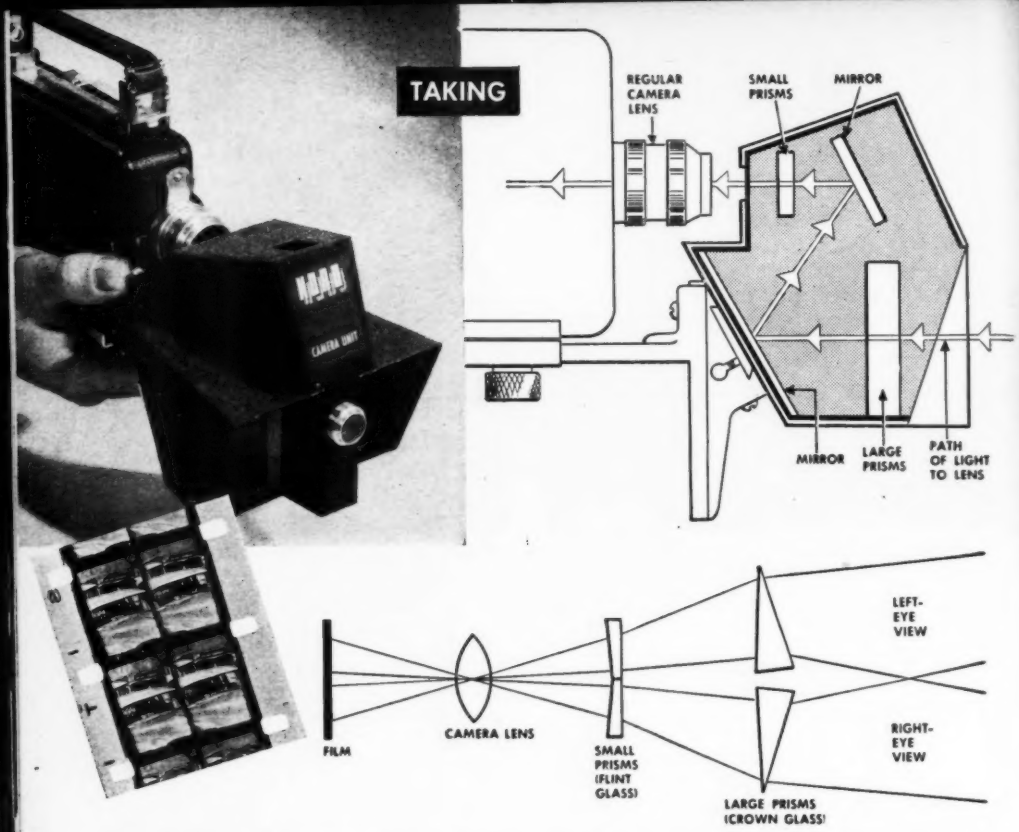
Blair checked the panel, took his hourly sun sight. The chart indicated that he was passing near the area where, 25 years before, the first attempt to reach the Pole by air had ended abruptly. Just about here, the Amundsen-Ellsworth expedition had been forced down a scant 140 miles from the goal. Blair recalled Ellsworth's description of that landing on a frozen sea, "choked with a chaotic mass of floating ice—it was like trying to land in the Grand Canyon." It sent a shiver up his spine. Excalibur's landing speed was 145 miles per hour!

The Moon Was There

Blair was due to reach the Pole approximately five hours after his departure. Fifteen minutes before the appointed time, he began to worry. The moon should now be popping up above the starboard sky line. It would be one degree above the earth at the North Pole. He strained his eyes through the intensifying haze. *No moon.* Was it because the haze was hiding it or—was there a joker lurking in that package? Perhaps he had just been chasing the sun around in circles all this while. He resisted an almost overpowering urge to forget the chart and climb to profligate heights to find out if that moon was really there or not. But then he realized that the moon must be hidden by the mist.

Moon or no moon, Blair was now rapidly approaching latitude 90 degrees north—the Pole. This is the theoretical pinprick on the ice where compass points dissolve and every wind that blows is from the south. Blair fumbled in his pocket for his son's letter.

[*Continued on page 304*]



STEREO ATTACHMENT for any 16-mm. home-movie camera makes two pictures side by side on each frame of film (enlarged in inset). Lower diagram shows principle of optical system: upper diagram, actual arrangement, made compact by adding a pair of mirrors to shorten rays' horizontal travel. View finder (omitted in diagrams) has own lens.

Third Dimension Added to Your Home Movies

WITH your own 16-mm. motion-picture camera, you now can make lifelike three-dimensional home movies.

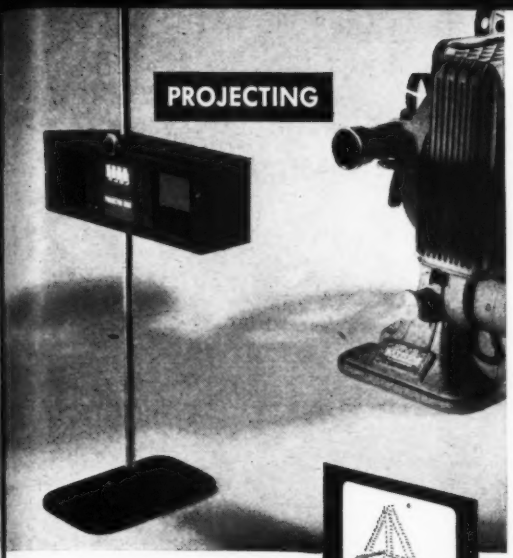
A new camera attachment produces stereo film, both in black-and-white and in color. It makes two pictures, corresponding to what your two eyes see, side by side on each frame of regular 16-mm. movie film.

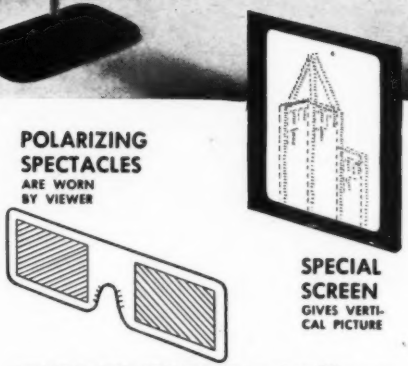
A companion accessory adapts your projector to show the film. Left-eye and right-eye views, differently polarized by light filters, are superimposed on the screen. When you wear polarizing spectacles, each of your eyes sees only the single view meant for it.

The result is startling and thrilling. People and scenes look as real as if seen through a window rather than on a screen.

Outfit Simple to Use

Taking the pictures is simple. The only changes in technique are an increase in exposure of about ⅔ of a stop, and use of the attachment's own view finder. Exposed film is processed exactly as usual. All that is tricky is done by the accessories themselves, in-





ADAPTER FOR PROJECTOR, acting like camera attachment in reverse, superimposes each pair of views on screen. It substitutes mirror system for prisms, contains polarizing windows. Polarizing spectacles, worn by all watching film, unscramble views.

troduced by the Nord Co., Minneapolis.

The camera attachment forms pairs of images by means of refracting prisms and auxiliary mirrors. (See diagrams.) A simpler all-mirror optical system, although found impracticable for taking, serves well for projecting. The beam of the projector strikes the point of a V formed by two mirrors in the projector adapter. Half of the beam is reflected to each side, then forward by another inclined mirror, and through a polarizing filter to the screen.

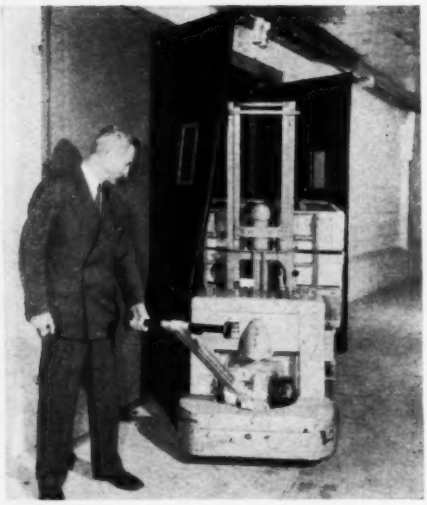
A special screen fits the resulting vertical picture, and its black border eliminates unwanted "ghost" images. A complete outfit, costing less than $100, includes camera attachment, projector adapter, 24- by 30-inch screen, and Polaroid viewing spectacles. These items also are available separately.

Glass Sleds to Ride Arctic Snow

TROOPS in the Arctic are being outfitted with sleds molded of glass fiber impregnated with plastic. The one shown above is seven feet long, weighs 36 pounds and hauls supply loads of 200 pounds. A cotton-duck cover adapts it for carrying an injured man. A similar four-foot sled will carry 100 pounds of rations, medical supplies, small arms and ammunition. One or two men pull the loaded sleds.

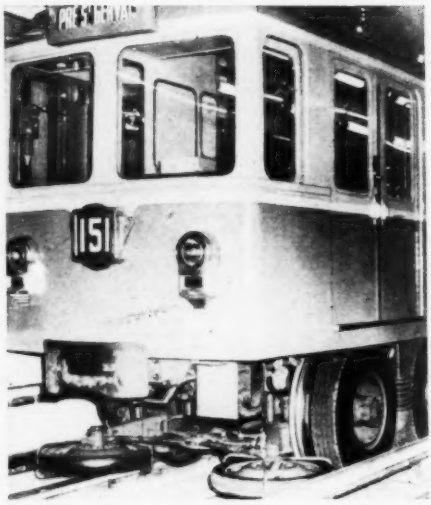
Blood Pump Speeds Transfusion

A TRANSFUSION of a pint of blood can be completed in only a minute and a half, using the new pump below. Letting the same amount of blood drip by gravity to a patient takes 40 minutes. Medical men call the new method safer as well as speedier because it reduces the risk of introducing dangerous air bubbles into the blood stream. Jan Petri of the American Optical Co. developed the blood pump.



Rubber Door Swings, Bends

WALK into the swinging door shown above and you won't get a black eye. Made of flexible rubber, it has built-in air compartments which are inflated by a hand pump. It is designed for warehouses and factories where power trucks often damage wooden doors. This one swings open at a touch, can bend to a 45-degree angle. Stic-Klip Co., Cambridge, Mass., makes it.



Subway Cars Get Rubber Tires

TO REDUCE noise and increase the comfort of riders, subway trains in Paris are being equipped with conventional truck tires that run on wooden runways. If experiments are successful, permanent concrete "tracks" will be installed. The tires shown in a horizontal position on the front of the car press against vertical tracks to guide the regular wheels.

Turboprops to Fly Tourists

THE Bristol 175 is Britain's bid for air travelers at tourist rates. It is a four-engined, turboprop transport designed for low-cost operation. The method of arranging seats allows accommodations for 50 passengers on long-distance oceanic trips or 100 passengers on shorter runs.

METHOD X IN ACTION. Tankful of kerosene bubbles and sputters as electric sparks bore a hole through a disk of super-hard tungsten carbide, submerged in the liquid, to make a blanking die (inset at left).

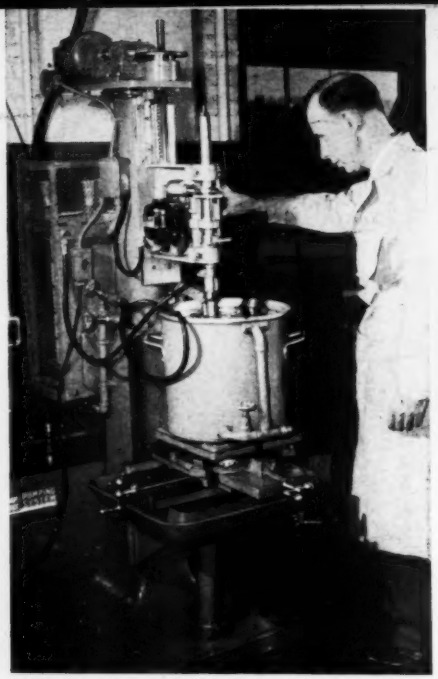
Electric Sparks Carve World's Hardest Metals

Method X quickly machines alloys that are slow work even for diamond tools.

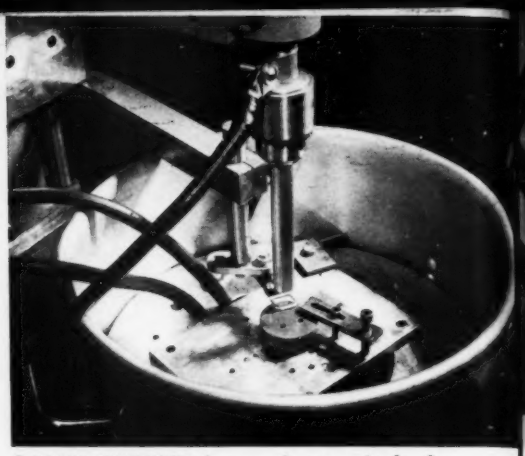
By Alden P. Armagnac

SPARKS of electricity now cut slots, bore holes and carve intricate designs out of the hardest of metals. Some of the jobs that the sparks perform could be done, before, only by diamonds. Others were just impossible.

This new spark process, called Method X, is expected to replace present costly and laborious methods of shaping tungsten carbide, the dark gray alloy that is one of the hardest materials known. Thus dies can be made of it, to turn out by the millions such things as razor blades and laminations for electric motors. Outlasting all others, a



MACHINE THAT APPLIES Method X looks like a drill press and has ingenious automatic drive. Inventor E. E. Teubner is pictured with it. Succeeding views illustrate how it works.



1 BRASS ELECTRODE is negative terminal of electric circuit. It is seen above disk of tungsten carbide, clamped in the tank, which has been made positive terminal of circuit.

tungsten carbide die may produce as many as 10,000,000 pieces before it wears out.

And Method X will shape other materials that have been machinists' nightmares—Stellite, Vitalium, S-816, tantalum carbide, titanium carbide and such promising new metals as pure zirconium, titanium, vanadium, molybdenum and tungsten. One experimental application is in shaping blades of heat-resisting tantalum carbide for the turbines of jet aircraft.

Machine Resembles Drill Press

You see no fireworks when you visit the Pittsburgh plant where Method X is applied. Instead, you find businesslike machines resembling drill presses. They are considered the most revolutionary metalworking invention since the introduction of the lathe.

One of them is boring a hole in a disk of tungsten carbide, and you are invited by Edmund E. Teubner, 36-year-old inventor of Method X, to watch it in action.

A brass electrode dips into an eight-gallon tank of kerosene, where the disk is clamped beneath the liquid. There is no visible spark or glow. But it looks and sounds as if the kerosene were boiling.

Its surface ripples and bubbles. Wisps of white vapor ascend. Voices must be raised to be heard above a sputtering noise like that of a pot boiling violently on a stove. Gingerly following Teubner's example, you put your finger in the liquid—and find it is only lukewarm. Here is what is happening:

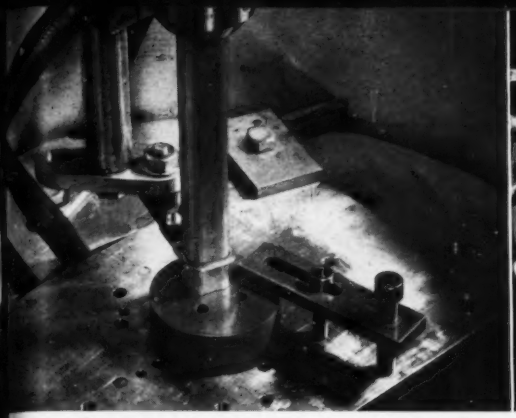
The tungsten disk is the positive terminal and the brass electrode the negative terminal of an electric circuit. A motor drive keeps the electrode almost, but not quite, touching the work. Intermittently a condenser discharges and tiny sparks leap the gap, breaking down the thin insulating barrier of kerosene. Lasting a few millionths of a second, each spark produces an enormous mechanical stress near the surface of the tungsten carbide.

Sparks Produce Craters

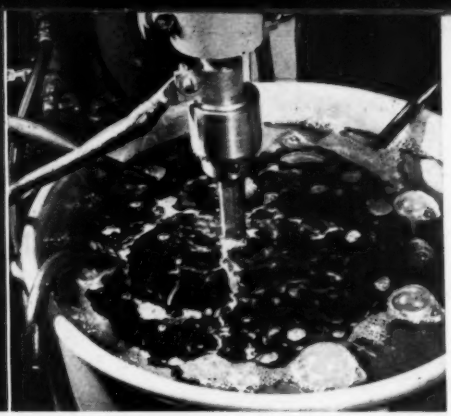
A microscopic particle of tungsten carbide flies off, leaving a crater. As successive sparks dance over the surface, the resulting craters merge to form a hole. The advancing brass electrode enters the material and goes right on through it.

Return a few hours later, and you find the job completed. A worker drains the kerosene, extracts the disk, and hands it to you. The newly formed hole is smooth and true. Making it has taken just three hours. By diamond grinding, the only other possible method, the job would have required at least a week.

When the electrode simply descends vertically, as in this case, it makes a hole with a cross section like its own. Ring-shaped and gear-shaped recesses can be cut similarly by electrodes of corresponding shape.



2 ELECTRODE ADVANCES through encircling guide and toward surface of disk. Under kerosene, which now is added, it approaches close enough for sparks to jump gap to disk.



3 KEROSENE prevents an arc from forming as sparks bore hole. There is no visible glow. It takes three hours to pierce the disk, a job that would need a week of diamond grinding.

To make more complicated cuts, the worktable may be traversed lengthwise, sidewise and vertically during the cutting. The electrode also may be rotated. A tungsten carbide piece has been pierced with a hole circular at one end, but gradually changing to oblong at the other. Another sample has a hole with screw threads; the electrode was a rotating, advancing brass screw. No other method could have produced some of these tricky carvings in super alloys.

Does Not Burn Metal

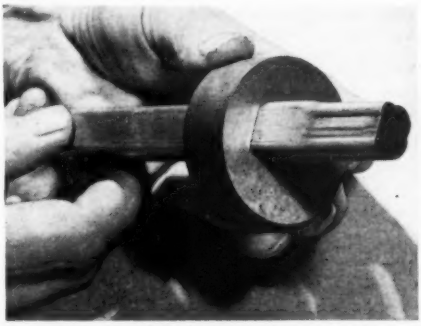
An alternate name for Method X is "spark machining." It should not be confused, its sponsors emphasize, with attempts to machine hard metals by the thermal action of an electric arc. It does not melt or burn metal away.

Electricity from a shop's regular 220-volt line is converted to direct current of a modest 100 to 150 volts and no more than 10 to 15 amperes—hardly enough to form an arc at all, in the usual sense. And the principal purpose of the liquid bath—which may be kerosene, fuel oil or a special compound called Dielectro X—is to *prevent* an arc from forming.

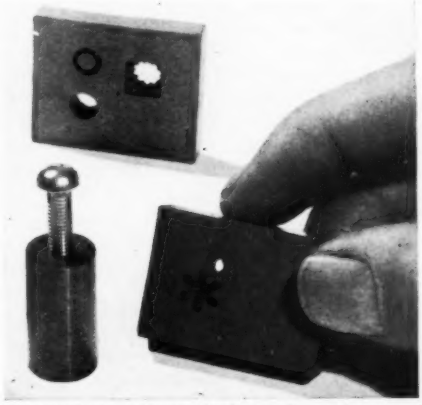
"Spark Erosion" Does the Job

Just how, then, do the sparks tear apart the toughest of metals? Dr. E. M. Williams of Carnegie Tech, who has made a study of Method X and arrived at what he believes is its first satisfactory scientific explanation, ascribes the results to "spark erosion."

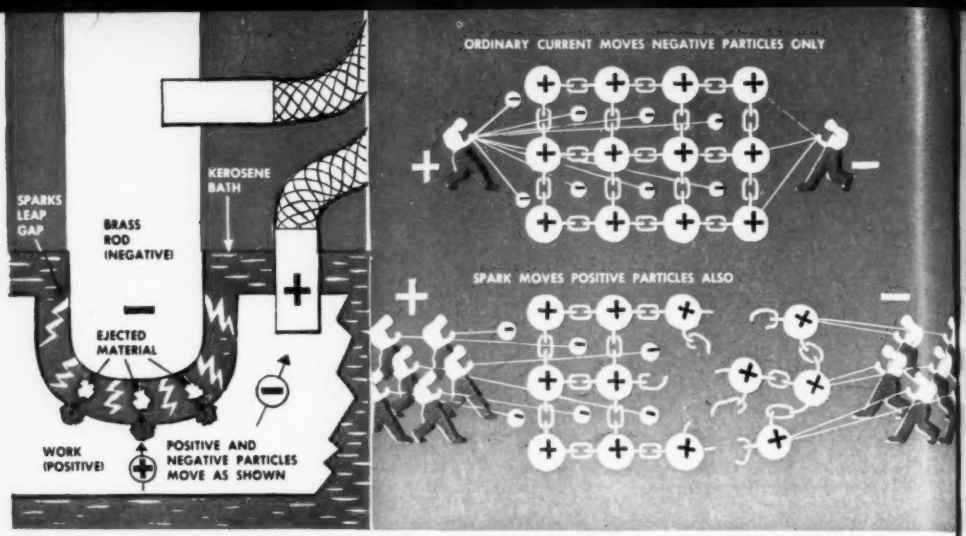
The atoms of an electrical conductor such as tungsten carbide contain two kinds of particles: negatively charged "free" elec-



4 RESULT IS SMOOTH HOLE of same outline as electrode, which slides through with snug fit shown. Electrodes with various outlines make holes of any desired size and shape.



5 VARYING SHAPE of electrode and way of applying it produced pinion-shaped and ring-shaped recesses as well as a threaded machine-screw hole in these pieces.



SECRET OF METHOD X is spark erosion, which tears bits of metal away from work. Here's why: Voltage applied across any conductor creates electrostatic force that makes negatively charged particles (free electrons) in alloy move to positive pole—result is ordinary current. Same force tries to pull rest of atom, which is positively charged, to negative pole. Alloy's tensile strength usually prevents this (upper right). Spark, however, creates electrostatic force strong enough to yank some of the positive particles free (lower right).

trons, and positive ions, the remaining portions. Applying a voltage to a conductor sets up an electric field, whose force drives the free electrons toward the positive pole. Likewise the positive ions tend to move toward the negative pole—but usually cannot, because the tensile strength of the material restrains them.

But when a spark jumps to a conductor's surface, it gives an enormous "current density" in a pin-point area. So strong is the resulting electric field that it acts on the positive ions with a pull of hundreds of thousands of pounds to the square inch. That is enough to break their bonds and start them going places. So these tangible bits of matter fly off the work piece with explosive violence, in the form of tungsten carbide particles measuring up to 1/10 of a millimeter or 1/250 inch in size. Some are hurled clear through the kerosene and into the air and have been found in oil droplets spattered from the tank.

Etching Needles Sparked Idea

Such erudite matters as ions' behavior were far from Teubner's mind when as a tool and diemaker, some years ago, he wrestled with the problem of making cheaper slide fasteners for clothing. A long-wearing die of a super-hard material like tungsten carbide was needed—but no existing machine could cut this material into the intricate shape that would be required.

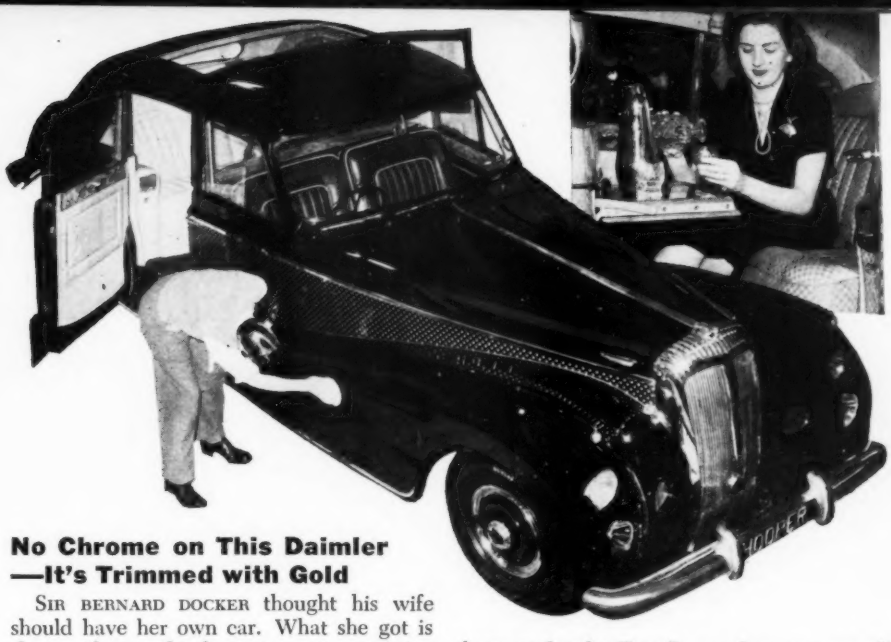
His first idea was suggested by electric etching needles, which will write your name on metal tools made of alloys as hard as tungsten carbide.

With a crude experimental rig, he tried firing sparks at hard metals in the open air. The only result was pitted craters, like those formed by destructive sparking in electric switches and auto distributor points. Sparks jumped erratically and undependably. Heat fused and distorted the metal. A film of oxide quickly coated the work, and the cutting stopped.

Coolant Solves the Problem

So Teubner dreamed up another scheme. As a machinist's mate in the Navy, he had used machine tools that sprayed a cooling fluid on the metal being worked, keeping it from overheating. That suggested immersing his experimental spark gap in a coolant.

He submerged his electrode and work in a potful of kerosene, a nonconductor of electricity that would not short-circuit the current. And now a new sound came from the spark. Instead of the desultory pistol-sharp cracks that were heard when it leaped an air gap, a steady sputtering came from beneath the liquid. When Teubner took out the piece of tough tungsten carbide, he found a hole drilled straight through it by the spark. *[Continued on page 304]*



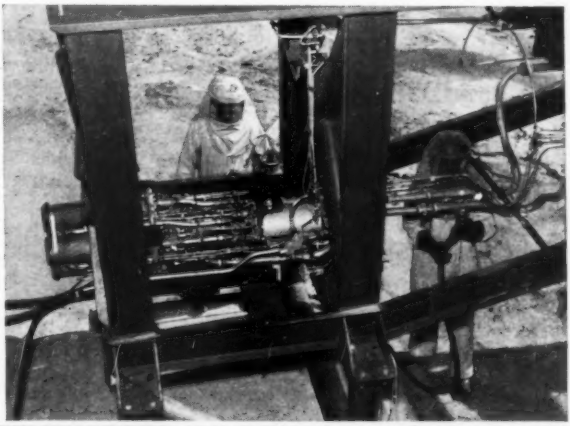
No Chrome on This Daimler —It's Trimmed with Gold

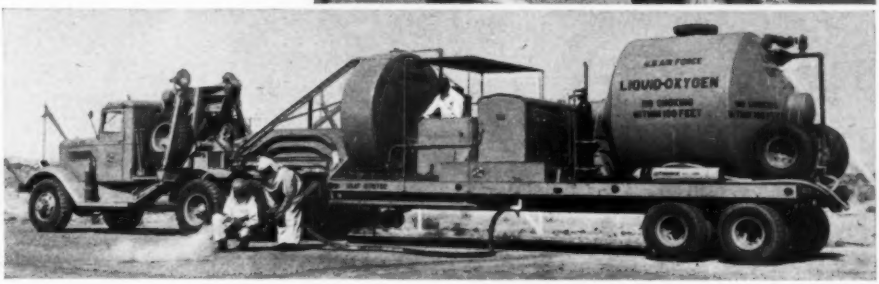
SIR BERNARD DOCKER thought his wife should have her own car. What she got is shown above: the largest, most expensive ($42,000) Daimler ever built. Among its little extras are 18-carat gold plate on all metal trim, inside and out; crocodile-leather luggage for the "boot"; a make-up case and a crystal cocktail set that fit on a built-in folding table (inset). P.S. Sir Bernard is head of the Daimler Co.

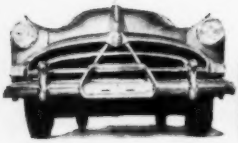
Giant Thermos Bottle Fuels Rocket Engines

THIS mobile rig supplies highly explosive fuels to rocket engines at Edwards Air Force Base, Calif. A water-alcohol mix is carried in the forward tank. The foot-thick double walls of the rear tank hold "lox"—liquid oxygen—under pressure.

At right, men in protective clothing fuel up for a test of a Reaction Motors engine like those used in Republic XF-91s.







New Hudson Hornet: Low, Fast and Tough

Winner of more stock-car races than any other U. S. car, the Hudson corners fast and sticks to the road like glue.

By Wilbur Shaw

ONE day last winter a chap named Marshall Teague sauntered into the Hudson Motor Car Co. in Detroit and asked, "Do you fellows realize that you've got one of the hottest things on wheels?"

I'd like to testify here and now to his estimate. I've just driven the '52 Hudson.

Teague knew. He had just come up from Florida where his Hudson had paced the field in a stock-car race. Hudsons have been winning races with monotonous regularity ever since, setting more stock-car speed records in the last year than any other U. S. car.

REPORT FROM THE

DRIVER'S SEAT...

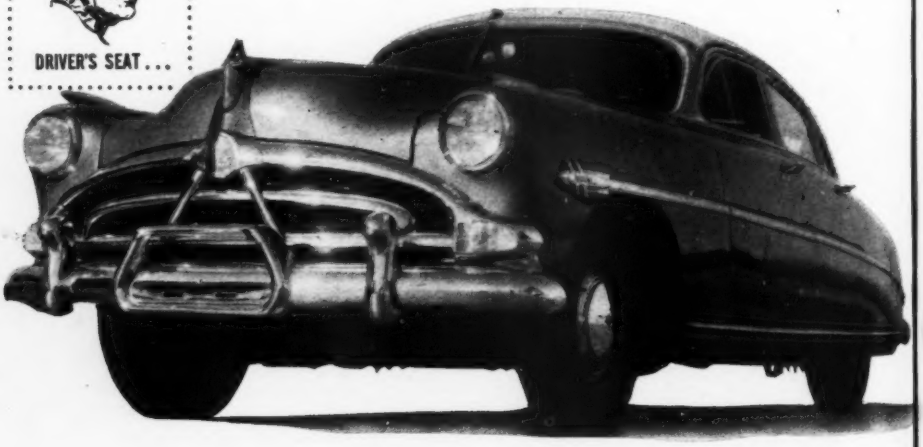
The real secret of Hudson's track performance is its cornering qualities—plus acceleration. It can take turns at higher speeds than other stock cars. That's because it has a lower center of gravity.

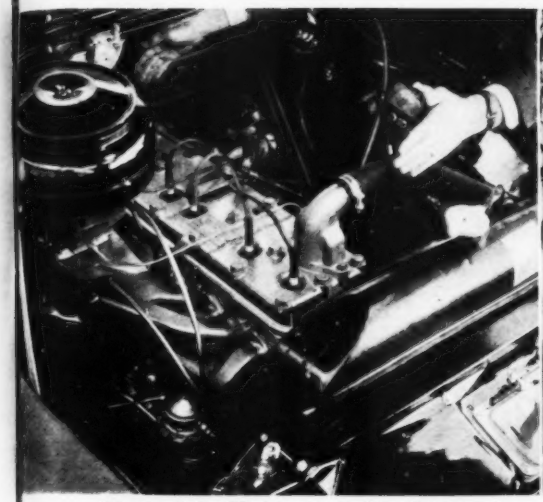
I had that in mind as I rolled a spanking-new four-door sedan with a Hydra-Matic transmission out on the Indianapolis Motor Speedway. Here's the start of my comments on my recording machine:

Hudson Hugs the Road

Regardless of price class, this is one of America's fine cars . . . and for my money, it's the most beautiful . . . Eventually, all automobile manufacturers will have to adopt Hudson's recessed-floor idea . . . with highway speeds going up, a lower center of gravity is a must for safety . . .

The car felt good. I recalled the Hudson that a train had struck at a grade crossing





Block of the Hudson six is big—28½ inches long and 8½ wide. The hard casting lets Hudson omit valve seat inserts. Intake valves are more than two inches in diameter.

The photographer caught me here doing 90 on the Speedway. That "chrome" on the Hornet on the facing page actually is stainless steel—defense use makes chrome scarce.

near Pittsburgh and carried 500 feet down the track. Damage: one bashed door and two blown tires. No one was scratched. That's because in the Hudson a girder-like frame completely encloses the passengers.

She gets away right now . . . this car has a higher ratio of power to weight than any other six-passenger car made in this country except one . . . but she does seem stiff . . .

I glanced at the mileage. No wonder—the car had gone a bare eight miles.

The ride is soft without being mushy . . . there's no pitch on sudden acceleration and very little in fast braking . . . there's 60 on the speedometer . . . 70 . . . now 80.

I went into a turn as the needle hit 85.

This is what I mean by stability . . . due to its low center of gravity . . . it simply refuses to lose its footing on a hard turn.

I eased off on the accelerator as I touched an indicated 90. That appeared, for the present, to be about tops. It takes several

I'm having a cup of Java on the 16-inch-wide center armrest which folds down from back of rear seat. For '52, Hudson's Super Six has been replaced by Wasp series.

That cut out in the doors provides two more inches of elbow room on each side. The ash trays are in these recesses—a good place for them, too. The trim knocks your eye out.

Visibility is superb. Hudson has, however, put an excess of polished reflecting surfaces on the panel, nullifying in part the advantage of the dull-finished windshield sill.

The seeming absence of a center post on the four-door sedan is a neat design trick exclusively Hudson's. Doors meet over post. Car has good ground clearance—8½ inches.

thousand miles of driving to break in a Hudson. That's because of the close fit built into the pistons and cylinder walls.

How many people know that the manufacturer of this car sets the piston clearance at only a half to one and a half thousandths of an inch? That is possible because the piston wall is solid—it has no split skirt—and the block, made of chrome-nickel alloy, is extra rigid.

Close Tolerances Save Money

That close tolerance puts a profit in the Hudson owner's pocket. If you put new rings in this car under 100,000 miles, you're wasting your money.

An experimental version of this same L-head engine, by the way, has been boosted to a 9:1 compression ratio. Hudson just wanted to show it could be done.

This automobile delights me . . . there's no wind-wander. Some potential customers might say the interior is too flossed-up . . . but me, I like it . . .

There's a nonreflective surface on the dash panel behind the windshield to reduce glare . . . but I'd say the stylists got out of hand on the instrumentation . . . to get—what's the word?—symmetry . . . the speedometer and clock are the same size . . . I find this confusing.

The "step-down" floor is 3½ inches below the door. Changes this year are minor. They include "bump strips" on sides and almost 90 square inches more rear-window area.

I wanted to see what this job would do on pickup. That's actually the second part of the secret of its performance in stock-car races. The racing boys use standard gear-shifts, of course. I didn't expect too much

[*Continued on page 266*]

FACTS ON THE '52 HUDSON

Model: Hornet four-door sedan.

Engine: 6-cyl. L-head; 145 hp. at 3,600 r.p.m.; car weight per hp., 24.8 lb.; bore and stroke, 3 13/16" by 4½"; compression ratio, 7.2:1; piston displacement, 308 cu. in.

Engine piston travel: (in feet per car mile at 20 m.p.h.) 1,957.

Crankshaft bearing surface: 48.6 sq. in.

Torque: 257 lb.-ft. at 1,800 r.p.m.

Transmission: 4-speed Hydra-Matic.

Rear-axle ratio: 3.58:1.

Steering ratio: 20.4:1.

Radius of turning circle: 20' 9½".

Effective brake-lining area: 166.3 sq. in.

Springs: front, coil; rear, semi-elliptic.

Weight and outside dimensions: 3,600 lb.; height, 60"; over-all length with bumpers and guards, 208 15/16"; width, 77¼"; wheelbase, 124¾"; overhang, front 37½", rear 47 3/32"; tread, front 58½", rear 55½".

Inside dimensions: seat-cushion width, front and rear, 64"; leg room, front 43¼", rear 38"; headroom, front 38¾", rear 37¼"; seat height, front and rear, 12½"; vertical distance, steering wheel to seat cushion, with seat in mid-position, 6⅞"; front-seat adjustment, horizontal 4", vertical ½".

Tire size: 7.10 by 15.

Horse Mounts Motorcycle

THE fun-loving 40 and 8 Club of the American Legion paraded this zany contraption at an Oregon state convention. A Harley-Davidson dealer revamped a three-wheel service car, replacing the carrier with a merry-go-round horse attached to water pipe and welded to a steel plate.

New Alarm Box Is Midget

THERE is no glass to break, no key to turn on this tiny fire-alarm box. Just pulling down the handle on the front turns in the alarm. Shown above with some of the oldest fire-alarm boxes in the U.S., it is made for use in hospitals and schools by the Edwards Co., Norwalk, Conn.

Window Box Airs the Baby

HE'S only a babe in a gridded cage, but he gets plenty of sun and fresh air. The cagelike play pen attaches securely to the window casing and juts out over the sill, high above the street. Photographed in use at a London day nursery, it looks like a good bet for apartment-house babies.

Air Truck Lands

Dust billows ahead as reversible-pitch propellers brake Air Force's new assault transport to a

Through cavernous maw in tail, heavy guns or five jeeps or 60 fully armed men can be loaded

This assault transport can ferry troops right to the foxholes, pick up the wounded and be off again in a matter of minutes.

By Tom Compere

A BIG air transport that can land in a bean patch is promising a revolution in today's foot-slogging ground warfare.

It can land soldiers close enough to the front lines to hear the crackle of rifle fire. In minutes, it can wheel about and fly out the wounded—for it can take off in little more than the length of a city block.

By moving large masses of men with incredible speed right up behind the fighting line, this type of plane may bring to infantry warfare some of the swift tempo that has come to war in the air.

It is certain to replace a lot of costly and dangerous parachute jumps. An airplane can deliver troops and heavy guns with far less risk of breaking bones and equipment.

This new type of flying machine—and the U. S. Air Force is ordering a lot of them—is meant to fill the gap between the swift air transport miles behind the battle lines

in a Bean Patch

stop on a landing strip only 900 feet long. With jet assist, plane can take off in 400 feet.

or unloaded in matter of minutes. Floor of cargo compartment is only 32 inches from ground.

and the slow truck transport up front. The plane looks like a truck with wings and is, in fact, called the "Avitruc" (Air Force designation: C-123).

The C-123 will do things that neither helicopter nor glider can do. Helicopters have been too small to air-lift very many men at one time. Gliders can land up front, but once down, they're through.

Plane, Helicopter, Glider All in One

The Air Force wanted an airplane, a helicopter and a glider all rolled into one. What it got was an "assault transport"—a glider with engines. Here's what it can do:

It can land and take off from small, rough fields. It doesn't need runways. It can land in corn fields—or bean patches—behind enemy lines on rescue missions.

It can carry 60 fully equipped troops, or big artillery pieces, or five jeeps, or 56 wounded men plus half a dozen medical attendants.

Fitted with auxiliary fuel tanks, it can fly the 5,000 miles from New York to Los Angeles and back again at a speed of 200 miles an hour—nonstop.

With the flip of a switch it can lower a king-size ramp built into its tail and disgorge its load in a matter of minutes.

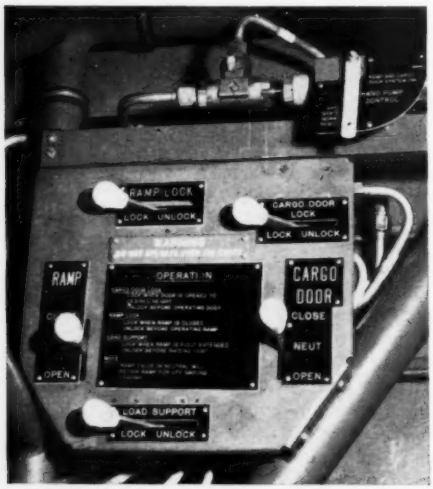
It can fly as a conventional airplane with piston engine and propellers, or with jet

FLYING TANDEM are an XC-123A jet-powered Chase troop and cargo plane, and C-123 Avitruc assault transport. Both have same design as gliders company built during war.

engines, or—and this is really the pay-off—even as a glider if the engines are removed.

How an airplane could get that way depends for explanation on a chap named Michael Stroukoff, who was chased out of Russia by the revolutionists 30 years ago.

Stroukoff, chief engineer for Chase Aircraft Co. of West Trenton, N. J., designed the winged truck. He said it was about time that airplanes could be operated in fleets off any fairly level field that happened to be handy. He was tired of seeing planes pampered with long, expensive runways.



CONTROL PANEL for hydraulic system opens, closes, locks steel ramp and cargo doors.

So he built a plane that would take the abuse of bouncing along on rough ground in landing and taking off. He wanted it to stop quickly, so he put on reversible-pitch propellers and outsize wing flaps. The second the wheels touch the ground, the props begin pushing instead of pulling.

He wanted his plane to take off in less distance than an automobile requires to reach 60 miles an hour, so he put JATO (jet-assist) bottles on the wings.

Plane Almost Sits on Ground

He wanted it low for easy loading and unloading. The fuselage almost sits on the ground even with the wheels fully extended. He wanted it to be easy to get into and out of, so he put on three doors.

He wanted it to be able to carry a lot of weight, so he put on what aeronautical engineers call a high-lift wing. He wanted to get guns and jeeps, as well as a lot of soldiers, into it, so he squared up the fuselage.

He wanted his airplane to be a work horse, so he fitted up the inside so he could put in and remove seats, install and take out litters, and lash down big guns—all in a matter of minutes.

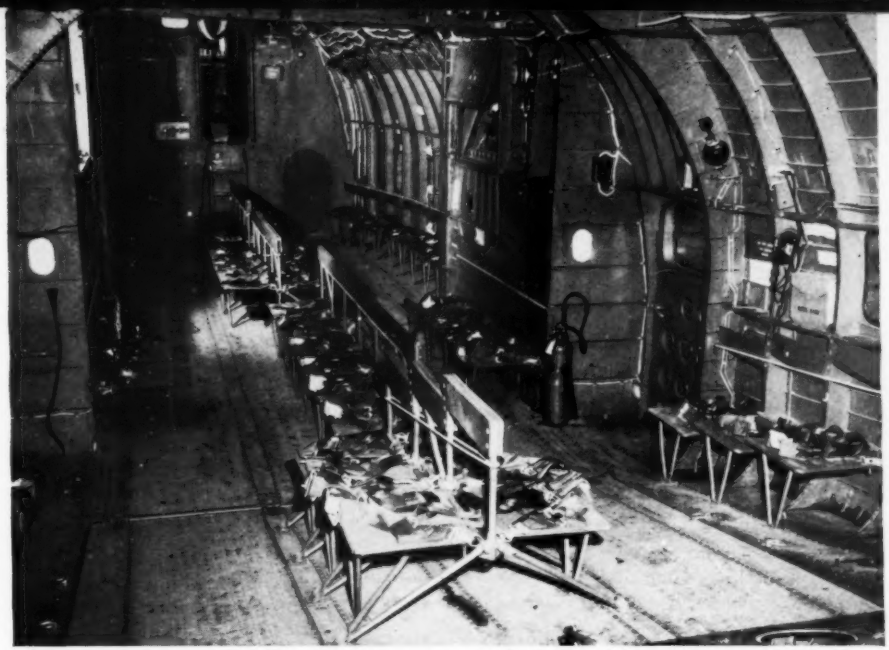
When he got all through, he took a few of his airplanes to some joint Army-Air Force maneuvers. They landed on ground that ordinary transports would avoid like plague. The "runway" was only a strip of level ground cleared of the worst of its underbrush. Infantrymen poured out of the doors of one of the planes. Then racks were locked into position in its interior. Litters were snapped into the racks. The plane took to the air again with a load of "wounded" soldiers. The whole operation consumed eight minutes.

Safer than Parachuting

Other Stroukoff planes touched down, stopped in clouds of dust and disgorged jeeps, howitzers, ammunition and additional infantrymen. Then they were off again for more supplies, at 200 miles an hour. Not a man was hurt, not a piece of equipment damaged, as inevitably happens in a parachute drop.

Mike Stroukoff watched with satisfaction as his planes proved that the tempo of battle could be stepped up by air.

He had only one complaint. "The landing field is too smooth," he said, "to show what my planes can really do."



INTERIOR OF C-123 is equipped with seats which can be folded away to make room for cargo. Supports for litter racks are permanently installed. Metal rings on floor are used to lash down cargo. Weighing 26,800 lb. empty, plane carries 27,200-lb. load.

REAR OF FUSELAGE has retractable steel ramp. Cargo compartment is 37 by nine feet, with eight-foot headroom. Wing span: 110 feet. Complete troop loading and take-off have been carried out in three minutes. Kaiser-Frazer will build 400 C-123s at Willow Run.

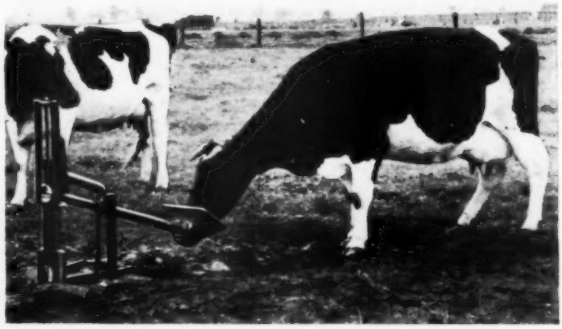
Jaguar Gets a Hard Top

THAT favorite of sports-car fans, the 124-mile-an-hour Jaguar, is now appearing in coupe form in the United States. The canvas top and side panels on the original XK 120 sports version have been replaced with steel and glass. Borrowing from American design, the new Jag has four ventilating windows instead of two. Otherwise, the body and engine remain the same.

Cows Pump Water for Themselves

GERMAN farmers are equipping their pastures with a pump so designed that cattle can draw their own water.

When a thirsty cow nuzzles the ladle attached to the pump handle, the handle is pressed down. Pumping action then fills the ladle with fresh water. The inventor claims the cows soon get the idea. The contraption won a prize at a recent agricultural fair in Hamburg.

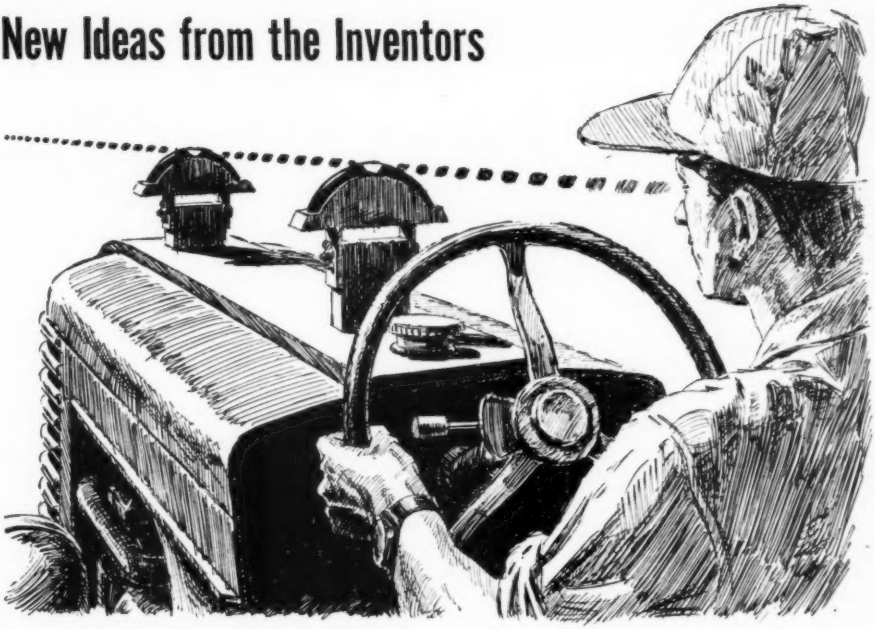


Liquid Rubber Stored in Cut-Down Sub

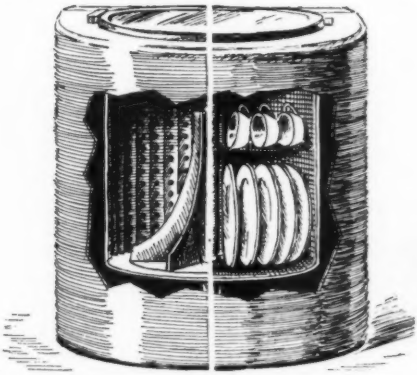
THIS converted submarine is used as a movable storage tank for liquid latex rubber. Ocean-going tankers unload into it instead of into permanent tanks along shore, relieving harbor congestion at Genoa, Italy. The old submarine naturally resists sea-water infiltration. It was cut down in length, fitted with pumps and a small analysis laboratory, and its compartments were rearranged.

Photo from Chemical Engineering

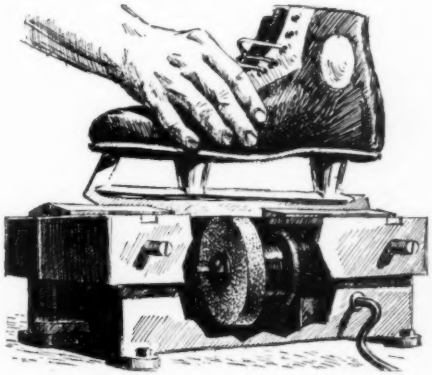
New Ideas from the Inventors



1 Tractor Sights to Aid Planting. The driver of this tractor would find it easy to plant straight crop rows even on a hillside. Two curved bubble tubes are mounted on the hood's centerline. To maintain a straight course, the driver would simply steer to keep the two bubbles lined up with a distant reference point. As the tractor tilted on a hill, the bubbles would always remain upright and in line with each other.



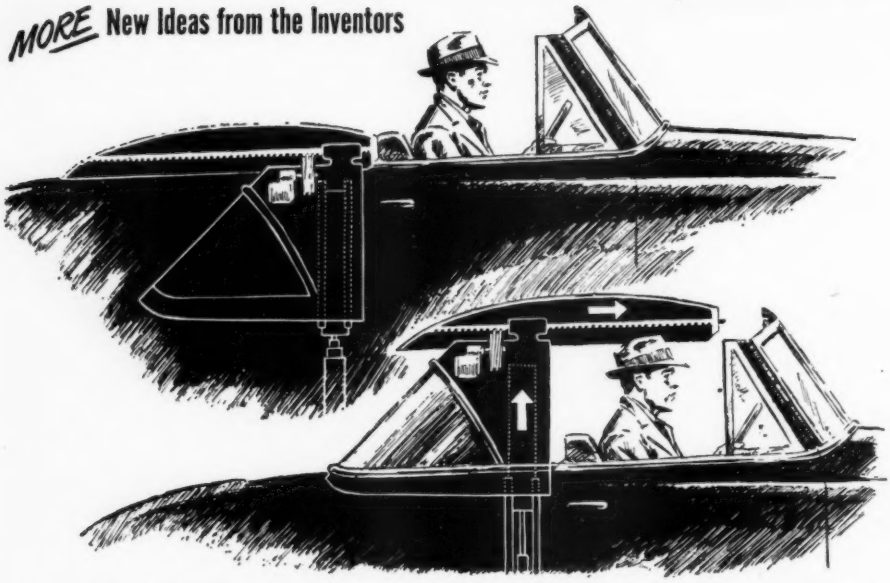
2 Machine to Wash Dishes or Clothes. Homes will need only one washing machine for both dishes and clothes if this idea catches on. An electric tank-type washer, it has a vertical clothes-washing agitator that can be quickly removed and replaced with a tiered dish-washing basket fitting on the same driveshaft.



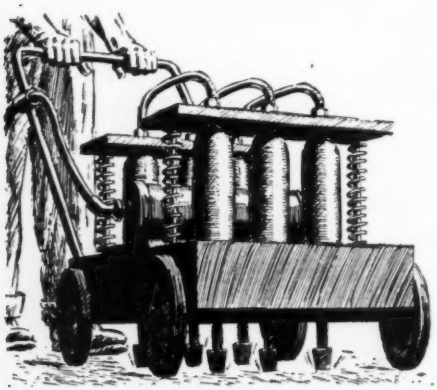
3 Skate Grinder to Be Automatic. The ticklish job of sharpening ice skates could be done easily at home with this electric grinder. A slotted guide on top would adjust to the blade width and desired depth of cut. Then the user would simply move the skate back and forth in the guide, automatically getting an accurate, uniform grind.

Please turn the page for three more new ideas.

MORE New Ideas from the Inventors



4 Hard Top to Collapse. All the features of both a closed car and a convertible could be enjoyed with this collapsible hard top. At the touch of a button, two hydraulic pistons would raise the one-piece rear section from a well behind the seat, while an electrically driven rack and worm gear would move the roof forward to meet the windshield. Lowered, the roof would fit over the rear deck.



5 Chipper to Remove Paint. Sailors would have an easier time removing old paint and scale from the steel decks of their ships with this air-driven machine. Seven chipping hammers mounted on a wheeled carriage and operated by compressed air would do the job quickly and more uniformly than it can be done by hand.

6 Oil Tester to Fit Flashlight. With only a flashlight and this attachment, any garageman could check crankcase oil visually for dirt. By placing a little of the oil in a depression in the plastic lens and switching on the light, he could compare it with clean samples of heavy and light oil sealed within the lens.

Patents on these inventions have been granted to: 1. B. Maier, Canby, Minn.; 2. E. Killin, Battle Creek, Mich.; 3. J. Fello, New York City; 4. H. George, Chicago; 5. D. Finn, Everett, Mass.; 6. L. Alexander, Charlotte, N. C., and J. Sherrill, Belmont, N. C.

Maybe You'd Like a Fur-Lined Car

WHEN Clyde Beatty, the animal man, slides behind the wheel of a specially upholstered automobile he owns, he sits on a female lion. The lion is quite dead. Its skin is interior trim in Beatty's "Safari" car, one of four Kaiser-Frazer show cars. The others, called "South Seas," "Caballero" and "Explorer," still belong to the company.

"SAFARI" has female lion skin on seats, male lion skin on floor. Edges of seats and door pulls are zebra skin. Lion mane can be seen at door sill, transmission tunnel.

"EXPLORER," trimmed with polar-bear fur, is downiest of four materials—and hardest to keep clean. Arm rests are mouton fur. "Penguin" vinyl covers outside of door panel.

"CABALLERO" is trimmed mainly in palomino pony and Arabian horse skin. Flanking saddle bag are bit chains. Hardware, silver-mounted, includes door handles made of spurs.

"SOUTH SEAS" upholstery is made of colorful cloth prints native to that region. Decorative effects are achieved with sea shells used as buttons, fish net, rattan, reeds.

Overhead-Valve Engine Powers Lighter Lincoln

A weight-reducing diet and high-compression oats are grooming this swank thoroughbred for a rail post in the race for power.

By Harry Walton

A BRAND-NEW luxury car rolled off the drawing boards into Lincoln showrooms this month. Hardly anything but the name remains of the Ford Company's famous upper-bracket automobile.

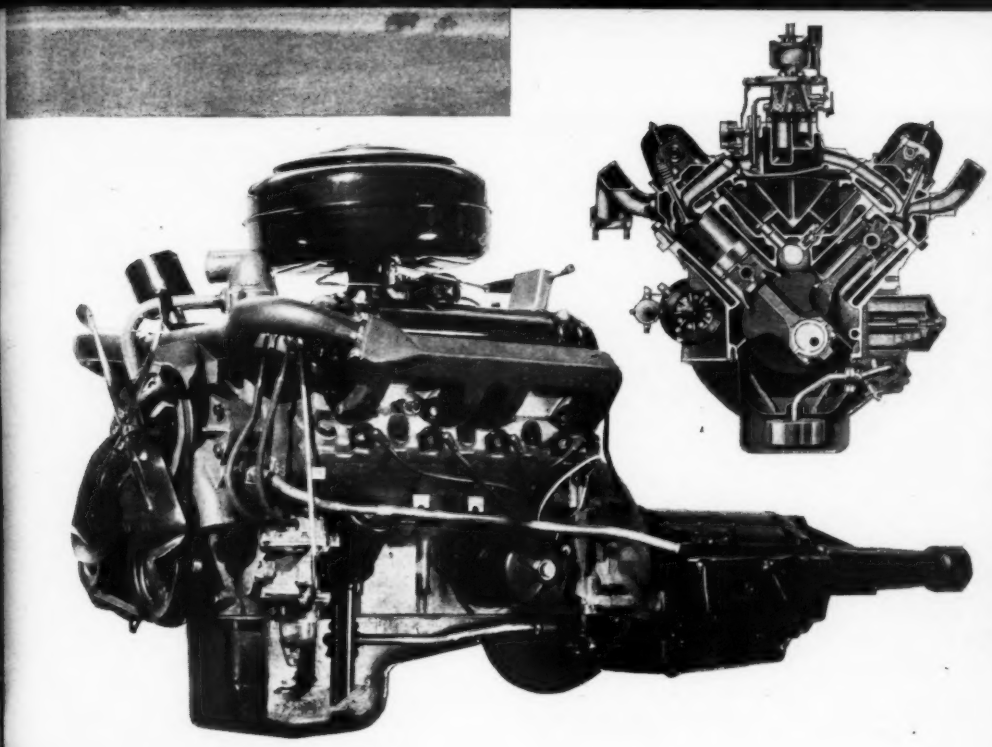
Determined to give competition a run for the swank money, Lincoln engineers jacked up the top and rolled under it an updated high-compression engine, a new frame and a completely restyled body, along with a designer's dozen lesser improvements. The new car weighs about 500 pounds less than the '51 Cosmopolitan. With a more powerful engine, this means the sleek '52 has an ample supply of take-off and go.

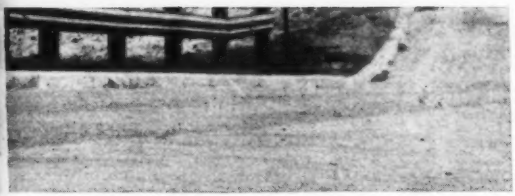
A dead black, unglamorous test job that was rolled out for PS readily did the zero-to-60 in 15 seconds flat. Equipped with Dual-Range Hydra-Matic, it took off with a smooth surge of acceleration that said there was more where that came from.

Top speed, the engineers and test drivers say, is something over 100. The near-90 we did on the Ford speed track was close enough for me, since I'm no Wilbur Shaw.

It's an Oversquare Engine

The famous L-head V-8 that long made Lincoln history now bows out in favor of a valve-in-head, oversquare engine. Over-





ENTIRELY NEW ENGINE resembles former L-head only in being a V-8. Bore is 3.8 inches, bigger than stroke (3.5 inches). Displacement is smaller than the L-head's (317 cubic inches), but compression is higher (7.5:1). Fuel pump is low on left. Distributor is high on rear of block. Car not only starts smoothly from dead stop on 30-percent grade (photo left), but Hydra-Matic even upshifts.

square is engineer's lingo for a bore larger than the stroke, common to the Olds, Cadillac and Chrysler V-8s. A short stroke decreases piston speed and friction drag.

Tipping the dynamometer at 160 horsepower, the new Lincoln V-8 has a smaller displacement than its predecessor—317 cubic inches instead of 337. Lincoln's compression ratio is 7.5:1, the same as Cadillac's and Chrysler's. The overhead-valve design will make it easy to raise this as octanes go up.

Like the other three high-compression V-8s, the Lincoln's has five main bearings, a single camshaft, and hydraulic lifters to keep valve lash to zero. Because of its design and a pressurized cooling system, the new engine gets along with a lot less water than the old—24 quarts instead of 34. Thus a smaller radiator helps save some weight.

The trend to high-compression engines now seems fairly well fixed. High compression turns more of the fuel's heat into work, throws less away in the radiator. Among the big luxury wagons, the only holdout now is Packard, with its straight-eight.

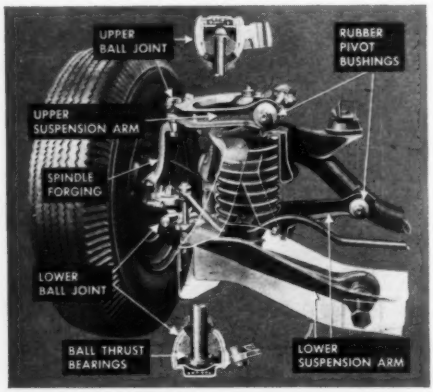
New Frame and Engine Mount

Where the X members of the Lincoln frame cross, they've added a side-to-side member to make the X carry some load as well as resist torsion. But the new member cuts down on muffler space, so the muffler is split into two units (one is called a resonator) that quiets the exhaust bark in two stages.

The frame's front cross member is way out at the end, instead of under the engine. The engine mount is a tubular drop member

farther back, almost under the middle of the block.

This brings the oil sump in front of the engine mount, where it's easy to drain. It also leaves plenty of room around the front of the engine, so they've moved the fuel pump forward, low down on the left side. Being 20° cooler there, the pump is less liable to vapor lock. It also has 18 inches less head to pump against from the tank.

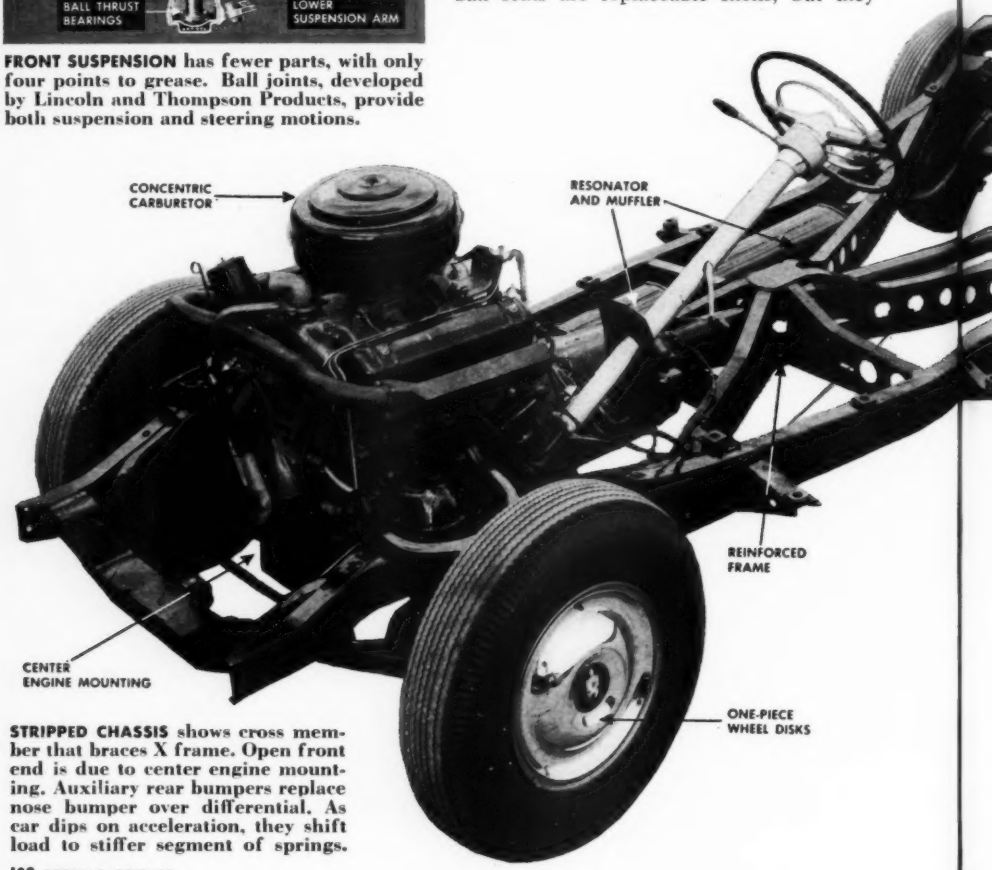


FRONT SUSPENSION has fewer parts, with only four points to grease. Ball joints, developed by Lincoln and Thompson Products, provide both suspension and steering motions.

Lincoln engineers claim a real improvement in the front suspension of the new car. To fit the new frame, the lower suspension arms are very wide Vs, with one leg pivoting on the foremost frame member, and the other on the tubular engine mount. Instead of the familiar pivot shafts, both upper and lower suspension arms have ball joints at their ends that are fastened with tapered studs to the spindle forging.

Those ball joints work two ways—they give you the steering action of the ordinary kingpin and the suspension pivoting necessary for walking over bumps. So freely do they work that steering effort is reduced.

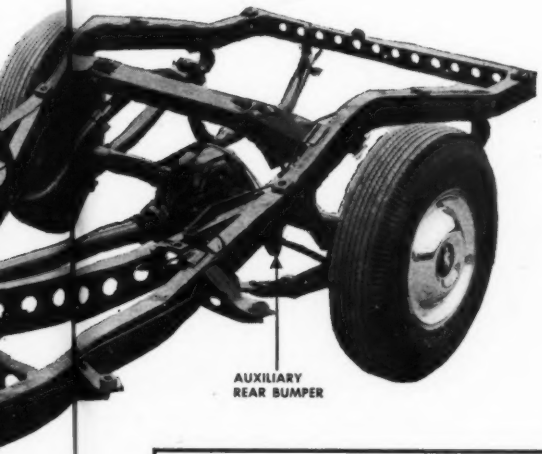
Part of this is made possible by ball thrust bearings in the lower ball joint. Both ball seats are replaceable shells, but they



STRIPPED CHASSIS shows cross member that braces X frame. Open front end is due to center engine mounting. Auxiliary rear bumpers replace nose bumper over differential. As car dips on acceleration, they shift load to stiffer segment of springs.

WIDE HOOD has front release like the Mercury's. High fenders thrust forward to carry headlights well ahead, just behind the high bumper. There is no radiator grille.

FENDER SKIRTS are standard. The bright-trimmed "air scoops" on fenders are dummies, just for looks. A real body improvement is front hinging of rear doors.



FISHTAIL EFFECT is achieved with massive taillight housing blending into the bumper. Trunk lid is generously wide, making it easy to load the big luggage compartment.

Facts on '52 Lincoln

Make and model: Lincoln Cosmopolitan four-door sedan.

Engine: V-8 overhead valve; 160 hp. at 3,900 r.p.m.; car weight per hp., 25.4 lb.; bore and stroke, 3 4/5" by 3½"; compression ratio, 7.5:1; piston displacement, 317.5 cu. in.

Engine piston travel: (in feet per car mile at 20 m.p.h.) 1,310.

Crankshaft bearing surface: 47.4 sq. in.

Torque: 284 lb.-ft. at 1,800 r.p.m.

Transmission: 3-speed synchromesh, standard; overdrive or Hydra-Matic, optional.

Rear-axle ratio: 3.92:1, others optional.

Steering ratio: 26.1:1.

Radius of turning circle: 22⅔ ft.

Effective brake-lining area: 202.34 sq. in.

Springs: front, coil; rear, semi-elliptic.

Weight and outside dimensions: 4,060 lb.; height (no passengers), 64 1/5"; overall length with bumpers and guards, 214 1/10"; width, 77½"; wheelbase, 123"; overhang, front 38 3/10", rear 52 4/5"; tread, front 58½", rear 58½".

Inside dimensions: seat-cushion width, front 60 1/10", rear 64"; leg room, front 42 4/5", rear 41 3/5"; headroom, front 36 2/5", rear 34 7/10"; seat height, front 12½", rear 12½"; vertical distance, steering wheel to seat cushion, seat in full rear position, 6 1/10"; front-seat adjustment, horizontal 4 1/10", vertical 3/10".

Tire size: 8:00 by 15.

INSTRUMENT PANEL is smart, but lighter (top right) is still a long stretch away. Note overhung brake (Hydra-Matic job has no clutch pedal). Blinker warns if hand brake is on.

A BIPOD JACK is standard equipment. Hand brake must be off when car is raised, to let jack settle back on rear leg. Screw action lifts or drops car easily, without jerks.

have not worn one out yet in 70,000 miles.

At the inboard ends, both suspension arms have rubber pivot bushings. There are only four grease fittings in the entire front-wheel suspension—for the ball joints.

No Holes in the Floorboard

In 1951 the British Ford Co. first used overhung, or pendulum, clutch and brake pedals in its English-built Consul and Zephyr. Now this idea has been imported for the Lincoln (and the Mercury, too—see p. 158). You'll find the pedals pivoted under the dash. This adds foot room, subtracts drafts.

And speaking of winter drafts, the Lincoln's underseat heater has its own blower and hot-water core, through which air enters from a duct on the left side. Over the right side of the engine there is an independent defroster unit, with its own blower and core, fed by air from another duct. This unit has a flap that the front-seat passenger can open if he's chilly.

Body Is Shorter, Roomier

With only two inches cut from the wheelbase (it's 123 inches instead of 125), the '52 Cosmopolitan is almost 11 inches shorter over-all, giving you that much less to cram into a tight parking space.

Visibility is better. The three-panel rear window is deeply curved at the ends, with some distortion there, but has plenty of look-through area. Fenders are high; you can see the right-hand one from the driver's seat.

Being lighter, the car rolls on slightly smaller tires—8.00-by-15s instead of 8.20s, which are now only on the convertible.

Five body types are available, including a new hard top.

Standard shift, overdrive and Hydra-Matic will be optional. Detroit talk has it the latter may be the new two-range type (PS, Jan. '52, p. 101). END

NEW SPOT FOR BATTERY, at right side of floorboard, keeps it cooler and requires less cable run. Longer battery, first developed for military use, has 63 plates instead of usual 39.

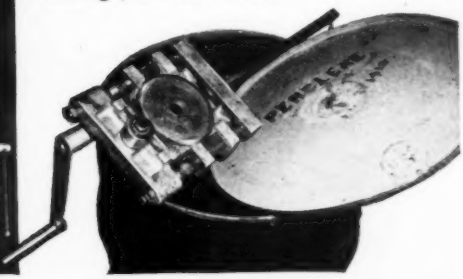
GAS CAP IS HIDDEN behind spring-hinged license bracket. As in Mercury, this shortens tank neck, enlarging usable trunk space. Gas hose reaches from either side.

Watch Out! This Beanstalk Killer's Mouth Is 16-Feet Wide

THIS 52-ton steel juggernaut works 10 hours a day on the King Ranch in Texas. It is two Caterpillar D8 tractors hooked together like Siamese twins. The seven-ton funnel 'dozer at the front cuts a 16-foot swath through dense mesquite and brush. The rear-mounted root plow bites 16 inches below ground and will uproot 40-foot trees.

'Can Opener' Peels Drum Top

IT ISN'T quite as handy as the kitchen size, but the grown-up "can opener" for steel drums (left and below) is nearly as fast and is safer, for it knurls the edges. The old factory method was to chop around the edges with a hatchet. Michael A. Schinker Co., Chicago, makes the tool.



Screwdriver Lights Its Way

FOR use in those dark corners this German screwdriver has a small flashlight built right into its handle (right). A screw cap at the end of the handle switches on the light, which shines down the shaft directly at the point where it is most needed. It is made by Maschinenfabrik Wilhelm Sievers of Lindau-Zech, in the French Zone of Germany.

Motorcycle Has Novel Trailer

THE man who owns this German motorcycle doesn't need to put up with back-seat driving. He can have his wife ride way back in the one-wheel trailer, which is attached by a curving tubular-metal arm.

My Most Ingenious Solution

A storm knocked out the power at our house. The only alarm clock I had was an electric one and I had to get up early the next morning. The power company crew that was working near by assured me the power would be on before morning. I went to sleep confident of being awakened in time. Why?

I had set the radio to a station that I knew came on the air at 7 a.m. and turned the volume up full.—Leonard P. Stolz, Harlingen, Texas.

FOURTEEN MOTORS, their 3,150 horsepower supplied by a Diesel generator, swing the 282-foot boom, toss out the bucket, drag it in and operate the giant's "legs."

Walking Shovel Scoops 27 Tons

TAKING seven-foot strides on broad feet of steel, this huge British crane moves by hopping instead of crawling like a caterpillar. Said to be the largest "walking" dragline ever built, it weighs 1,600 tons and can scoop up 27 tons at a bite.

ONE MAN HANDLES THE CONTROLS in a small cabin above the machinery room. From the outside (shown in the photo at right), the control cabin resembles a ship's bridge.

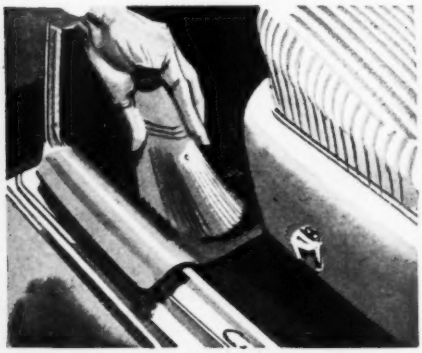
DUCKLIKE FEET OF THE CRANE are visible at far left and right (beyond the men) above. Motors move feet ahead or back, plant them firmly, then shift crane's huge body.

BUCKET WEIGHS 22 TONS when empty and 49 tons full. The crane is used for opencut iron mining in eastern England. Building it took Ransomes and Rapiers, Ltd., four years.

I'd like to see them make . . .

Everyone has his own pet idea of some gadget he would like to see in general use. What is YOURS? *Popular Science* will pay $5.00 for each one published. Use government postcards only. Contributions cannot be acknowledged or returned.

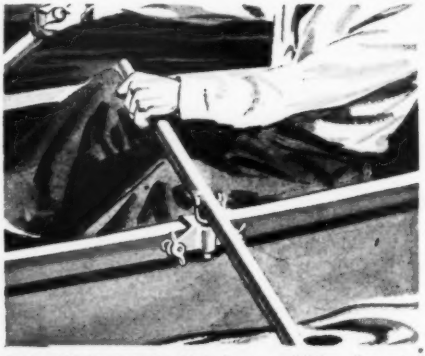
AUXILIARY AUTO TOPS attached with suction cups, to reflect heat of the sun. Air flowing between surfaces would also help to cool car. —*E. E. Youngkin, Altoona, Pa.*



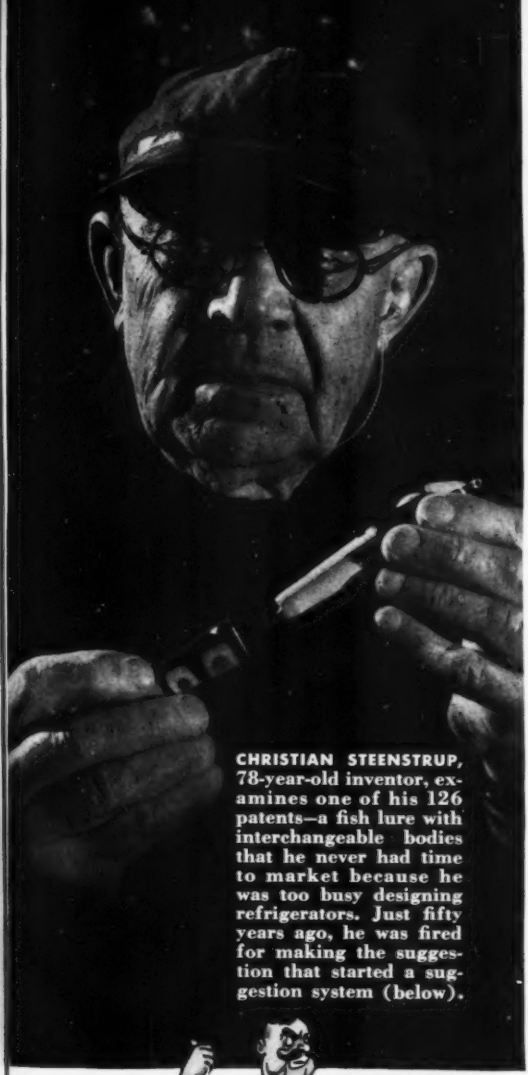
AUTO FLOOR MATS WITH A FLAP to be placed over the door sill when sweeping out the car. Flap would fold under when not in use.—*Roy McGuckin, Fairlawn, N. J.*

A GARDEN SPADE WITH SHORT PRONGS so that you could dig into hard earth without first softening it with a pitchfork.—*Richard Johannesen Jr., Yonkers, N. Y.*

A DRIER ATTACHMENT FOR WASHING MACHINES, consisting of blower, motor and heating element. It would attach to open door of washer.—*Charles M. Wesner, Chevy Chase, Md.*



ATTACHABLE OARLOCKS that could be clamped to any part of a rowboat or sailboat for extra rowing power or as an aid to steering.—*Robert Marie, Fort Wayne, Ind.*



CHRISTIAN STEENSTRUP, 78-year-old inventor, examines one of his 126 patents—a fish lure with interchangeable bodies that he never had time to market because he was too busy designing refrigerators. Just fifty years ago, he was fired for making the suggestion that started a suggestion system (below).

He 'Invented' a Way for You to Make Money

Fired for suggesting his first idea, Christian Steenstrup made it possible for other employees to cash in on theirs.

By Philip Gustafson

THE little fellow with the big idea is cashing in these days to the tune of millions of dollars. Suggestion plans adopted by employers have made this possible. One of the first well-rounded plans for encouraging workers to think, and paying them for it, was formally launched by General Electric in 1922. Since then, this company alone has paid out $3,218,000 in awards.

The man who offered the first suggestion at General Electric, however, got fired for it.

He was Christian Steenstrup, a serious young toolmaker from Denmark who still spoke English with difficulty. While walking through the Schenectady factory one day, Steenstrup was depressed by the sight of the hands of the men who were feeding the pounding, grinding, roaring machines. From many of those men's hands, thumbs and fingers were missing.

The memory haunted the young man, and he began to study the bloodthirsty machines during his lunch periods. Nights, he worked at his drawing board and, after many false starts, he evolved an automatic feeder that he knew would save men's fingers—and perhaps their arms or lives. It would also increase production.

Excitedly, Steenstrup took his sketches to his foreman. Handing them back with a sour look, the foreman told him that the company had plenty of engineers to work out its inventions. But Steenstrup had faith in his idea. When his regular foreman was out sick, he showed the sketches to the substitute. This man asked Steenstrup to build a model of his automatic feeder. Over a single week end, Steenstrup threw one together.

Suggestion for Suggestions

It did everything as he had hoped. It increased production and protected materials and workmen's fingers. But when the regular foreman returned, he fired Steenstrup.

Luckily, the manager of the factory heard about the incident and called Steenstrup back to work. Shaken by the experience, Steenstrup thought of other employees who might have valuable ideas and not be able to get a hearing. And he convinced the factory manager that the company should set up some *neutral* channel through which employees could submit ideas and be paid off in cash and promotions.

The idea was not wholly new. National Cash Register had gone into the suggestion business in 1894, and Eastman Kodak had started its plan in 1898. But such plans spread slowly at first. Steenstrup became chairman of the General Electric suggestion committee in 1919, pumped life into it, helped to make it one of the largest such systems in the world, and other companies

When he leaves home, his workshop goes

followed suit. Now a national association of 475 members has sprung up to spread the know-how of handling new ideas.

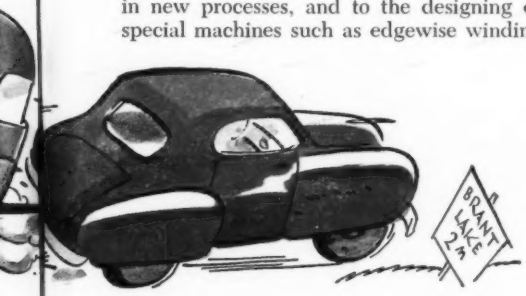
Christian Steenstrup himself became one of the country's leading inventors, with 126 patents. He is retired now, but still thinking, and working in a home workshop—and his reminiscences constitute a great American success story.

He became an apprentice in a foundry at 14, came to America as a journeyman when he was 20, worked day and night turning

"Bed is a wonderful place to think," insists Steenstrup. "I've done my best thinking in bed."

out gun models for the American Ordnance Co. during the Spanish-American War, and went to work for the General Electric Co. as a toolmaker in 1901. During his 44 years with that company, he made creative contributions that added millions of dollars to the nation's industrial wealth.

Soon after he invented the finger-saving device, and became a missionary for Suggestion Systems, he was made foreman of a department devoted to experimental work in new processes, and to the designing of special machines such as edgewise winding



with him: "Suppose I think of something!"

tools, peculiar to the electrical industry. Here he was in his element, with ample scope for the exercise of a natural inventive talent.

The manufacture of turbines for generating equipment became increasingly important at General Electric. Sweden had developed a new type of steam turbine, and Steenstrup was sent to study both the manufacturing and operation of steam turbines there. When he returned he was put in charge of the building of several giant turbines, and his work substantially increased the efficiency of those great power plants.

Another promotion followed. He became supervisor of mechanical research, directly responsible for the design of special equipment throughout the Schenectady plant.

Two Awards in a Row

GE research men had long known the possibilities of the hydrogen copper-brazing process. But no one thought it was practical for commercial work, except Steenstrup. Despite dark predictions, he applied the hydrogen brazing process to manufacturing and won the Charles A. Coffin Award, which is bestowed annually on the man or woman in the company who has done the most for the progress of industry. The process he developed is used today to make the hundreds of miles of tubing that are the lifelines of automobiles and airplanes.

Later, Steenstrup received a second Coffin Award for his part in placing the refrigerator in the prominent position it occupies in industry and American homes. His refrigeration experiments began in 1923. General Electric had been experimenting for years with hermetically sealed units that were cumbersome and expensive. The GE unit then had a heavy bronze case which added much to its cost. Steenstrup was asked to design a new case and an evaporator to fit the compressor.

Helped Create a New Industry

He decided that he could also make a better compressor. He then designed and put into operation a complete refrigeration machine which retained the advantages of hermetic sealing and yet was efficient, simple and economical to manufacture. That machine was the prototype of millions of sealed refrigeration units which followed. It created a multi-million-dollar industry.

The retirement six years ago of "the Father of the Refrigerator" at the age of 72 has not changed the inventor's habits much. He used to be up at four every morning. Now he doesn't get out of bed at that hour—he just lies and thinks until perhaps six or seven o'clock. "Bed is a wonderful place to think," he insists. "I've always done my best thinking while lying in bed."

Champion Suggester

To show what Suggestion Systems can do for employees, General Electric officials like to cite the case of Sophie Baikusis, a widow with two children, who once had a routine job assembling insulators. When she suggested a way to improve the insulators, her floor boss snickered. A woman, thinking up inventions! But Steenstrup's philosophy had been accepted by then, and the floor boss told Mrs. Baikusis to write her idea down. Her two cents' worth won a $35 award.

But that was only the beginning. She submitted suggestion after suggestion, was called back 54 times to receive awards, built a four-room cottage and sent her children through school with the proceeds, and eventually won the company's Coffin Award.

[*Continued on page 258*]

Aids to Modern Living

Needle Threader. With this gadget even a man could thread a needle blindfolded. A plunger with spring action does the job in a jiffy.

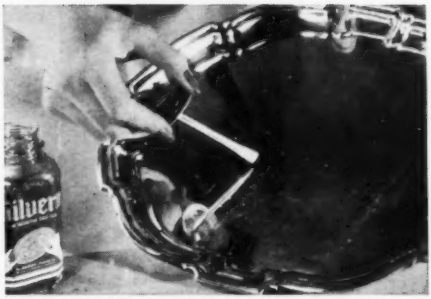
As shown in the drawings at far right, the plunger is pulled back, the needle is inserted eye down and the plunger is then released. The thread is next looped over the end of the Bakelite threader and the plunger drawn back again. A tiny wire hook engages the thread, revolves the needle to place the eye in the proper position and draws the thread through.

The container that the threader comes in has a clamp for holding it steady. Sewing-machine needles can also be threaded. *Wink Needle Threader Co., Brooklyn.*

Electric Honer. The motor-driven sharpener below takes the work out of keeping sharp edges on the kitchen knives. It plugs into an AC outlet. *Herbert's Inc., Seattle.*

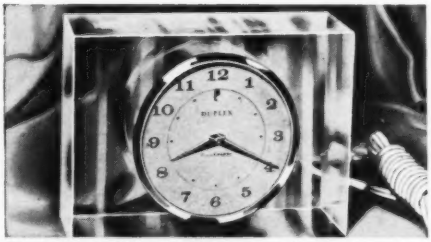
Grinder Mount. A housewife invented this aluminum food-grinder stand. It fits any sink, won't scratch, lets drippings run into sink. *Gadget of the Month Club, Los Angeles.*

Flatware Washer. Just fill the Sinkette with soapy water and stand the silverware inside to soak clean. Rinse by flushing clear water through intake funnel. *Chemex Corp., N.Y.C.*

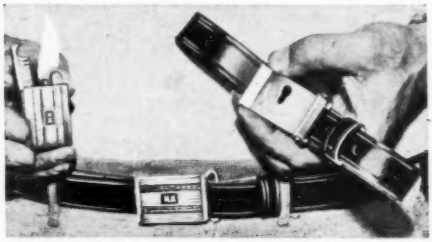


Tarnish Preventive. This transparent plastic coating, applied with a brush, seals in the gleam of any metal. To remove the Vinylite-resin film, prick and peel off. *Merchants Chemical Co., Stamford, Conn.*

Foot Warmer. Plugged into an electric outlet, this little rubber mat will keep toes toasty on a cold floor. It contains no heater wires, being made of conductive rubber. *Goodyear Tire & Rubber Co., Akron.*



Two-Way Clock. If power fails, this electric clock still keeps time. A hand-wound spring drive takes over till current is restored. *Duplex Clock Co., Chicago.*

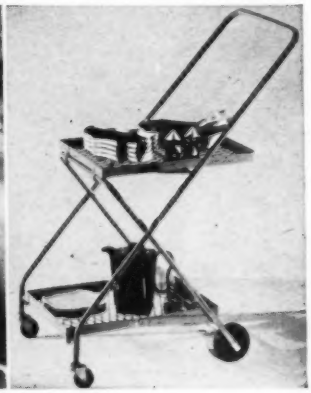


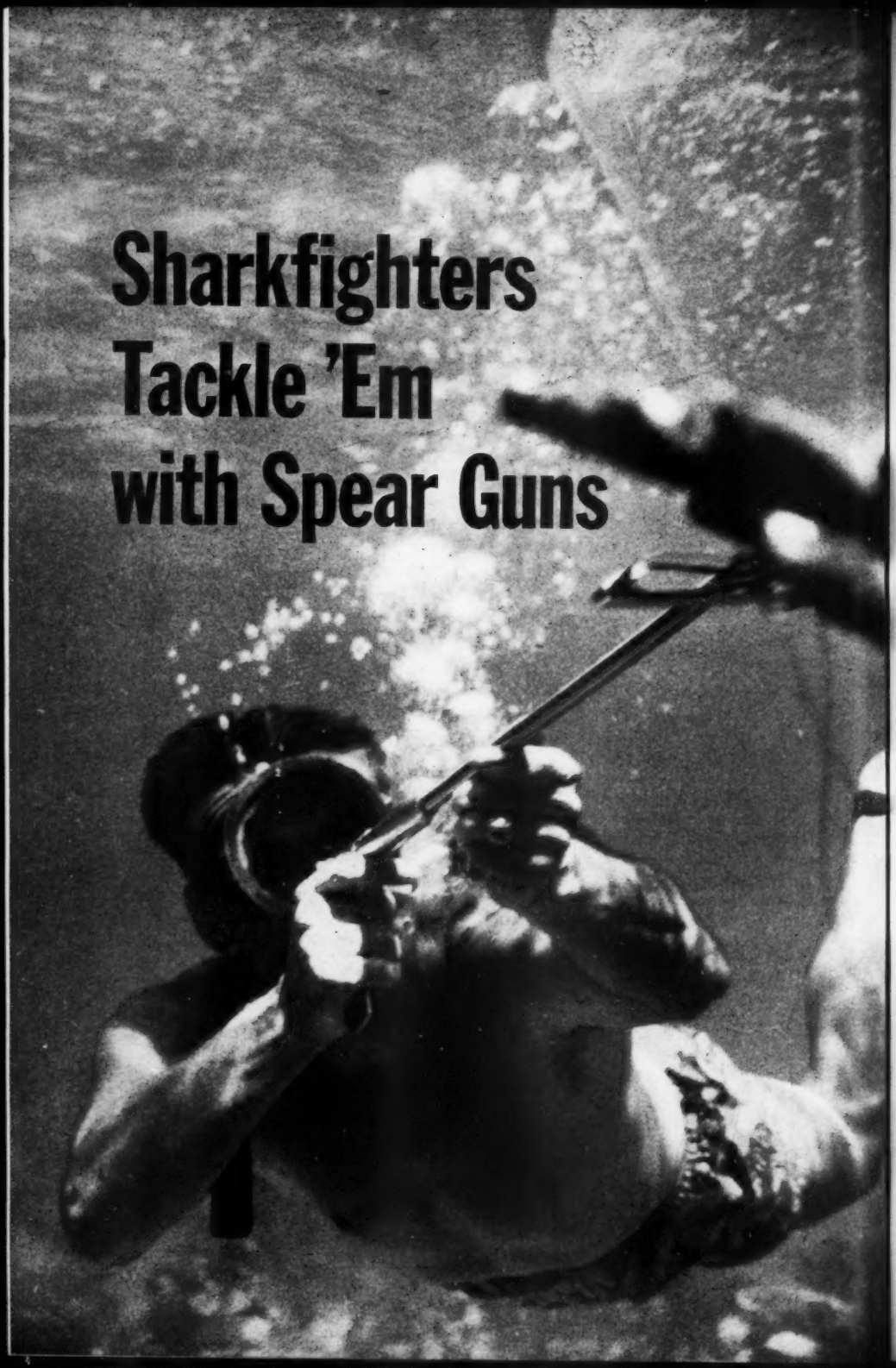
Buckle-Lighter. A cigarette lighter forms the face of this belt buckle. It slides on and off easily and has a full-size fluid well. *Krimstock Brothers, Philadelphia.*

Hand Warmer. Tiny heaters like this tucked in gloves or pockets will keep hands warm in zero weather. Chemical reaction makes the heat. *Edmund Scientific Corp., Barrington, N. J.*

Wallpaper Coating. Crayon scribblings on the wallpaper wash off if you have applied this resin finish. Said to make any color-fast paper washable. *Plasti-Kote, Inc., Cleveland.*

Multipurpose Cart. This versatile truck is tea wagon in winter, patio cart in summer, shopping and laundry hauler all year round. Folds flat for storage. *The Stones, Glendale, Calif.*




Sharkfighters
Tackle 'Em
with Spear Guns

BIGGEST KILL TO DATE was this huge hammerhead shark. Left to right are Charlie Almeida, Al Crockett, Ernie Ryckman and Wally Pallack. Three-hour fight landed the big fish.

It looks like a short cut to suicide —but you can't beat spear fishing for thrills. Try it and you're hooked.

By Denis Sneigr

DOWN around the Florida Keys—those sunbaked stepping stones that dribble away into the Gulf of Mexico from the southernmost tip of the U.S.A.—you'll find a little group of guys who pursue one of the daffiest—and deadliest—pastimes ever devised by man.

This sport in which grown men in their right minds deliberately seek the dubious companionship of the shark, the barracuda and the vicious moray eel is known as spear fishing.

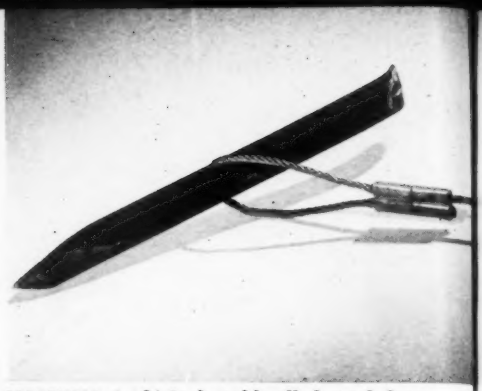
If this is fishing, Izaak Walton took in a bit too much territory when he titled his classic tome *The Compleat Angler*, for the worthy Izaak never dreamed of anything like this. There's no rod, no reel, no bait, no net. They don't catch 'em—they shoot 'em. And these fabulous fishermen stand an uncomfortably good chance of getting hooked by their quarry instead of the other way around.

Spear Fishing Pays for Itself

Charlie Almeida, Wally Pallack and Ernie Ryckman—three old hands at the game—will tell you proudly that their favorite sport pays for itself. The proceeds from the sale of the food fish they bring in—snappers, groupers, turtles, jewfish, lobsters and such marine delicacies—more than cover the cost of the necessary equipment. So, unless a man places a certain value on life and limb,

BARRACUDA abound in waters off Key West. Experts say the vicious fish will attack men. Charlie Almeida shot this one after it had stolen a big snapper that he had speared.

MORAY EELS have a mouthful of sharp teeth and a crabby disposition. They frequent holes in coral. Ernie Ryckman holds big one that charged him from under coral ledge.



SPEARHEAD is ⅜-inch cold-rolled steel four inches long. One end is ground to a point, other drilled for 5/16-inch spear. Head pivots on loop of 1/16-inch aircraft cable.

he really hasn't a thing to lose when he goes spear fishing.

The three daredevils don't have to do it for a living anyway—Charlie plays in the band in the Bamboo Room, a Key West night spot, Wally's a Navy CPO, Ernie a carpenter. They do make spear guns in their spare time and sell them to fellow enthusiasts, but they fish for the fun of it. Tag along on one of their seagoing safaris, and you can judge for yourself.

Before you slip over the side of the 14-foot outboard-powered boat to duel with some of the ugliest customers of the Florida deep, take your choice of weapons: the rubber gun, powered by eight 18-inch lengths of the kind of surgical rubber tubing the doctor wraps around your arm when he takes your blood pressure, or the CO_2 gun. When you pull the trigger on the latter, compressed carbon dioxide gas launches the spear with terrific force.

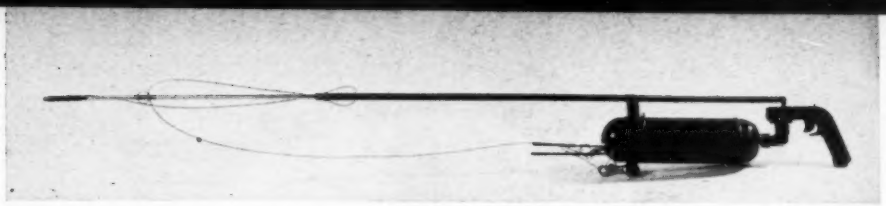
The rubber gun is lighter and easier to use, and it floats; the CO_2 weapon packs more punch. The fact that it won't float doesn't bother these boys—if both hands are needed underwater, the gun is parked on a coral ledge on the ocean floor.

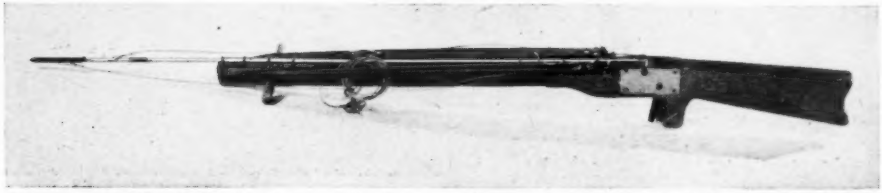
Next come flippers for your feet, like the Navy frogmen's, and a face mask (this sport is also called "goggle-fishing"), which doesn't provide any additional oxygen but does permit clear underwater vision. Tuck a knife in your trunks—handy for minor emergencies like wrestling a mako shark—and you're set to tangle with turtle or tarpon. But first, let's watch the experts.

Shark Puts Up a Whale of a Battle

October 5, 1951, marked a high point on the calendar for these guys to whom adventure is meat and drink. On that particular and wonderful morning it was a foursome—Al Crockett, another Navy man, being in the boat. They were out hunting jewfish—a giant (up to 750 pounds) member of the grouper family and a prized food fish.

The four men were just lazing along taking it easy when, at the same instant, Crockett and Charlie caught the sun's glint on a huge dorsal fin cutting the shallow water off Boca Chica Key. All thoughts of sluggish groupers were forgotten—they were after hammerhead shark. A float was fixed to a spear gun. They got the boat over there fast and drew in close enough to get the first spear into him just below the mouth. As the great fish rolled, one of the men grabbed the float. The hammerhead pointed his blunt snout for the open sea and the





CARBON DIOXIDE GUN (top) is made from CO_2 fire extinguisher with handle turned 90 degrees. Wooden gun (bottom), powered by surgical rubber tubing, works like slingshot. When spear is shot, shaft drops off and head passes through fish, turning sideways to lock on. A 12-foot cable connects head to gun; a 10-foot cable connects shaft to gun.

chase was on. Three more spears went into the shark. He flipped over, snapping the lines like thread, and broke free.

At this point Pallack went overside, got hold of the trailing lines, and it was secured to the boat. The shark kept traveling. Now Ryckman went into the water. He attacked the creature with his knife, slashing repeatedly at the belly. He was knocked away by the thrashing tail. With no signs of tiring, the hammerhead redoubled his efforts to reach blue water.

To hold him back Charlie turned up full throttle on the 25-horsepower Mercury engine. The resulting tug of war was about even, with the killer fish having a bit the better of it. Pallack accepted a second invitation to sudden suicide. Knife in hand, he again dived into the churning water. That

[Continued on page 260]

Woman Scientist Spears Rare Poison Fish in Red Sea

SPEAR FISHING, primarily a thrilling sport, sometimes serves the cause of science, too. Dr. Eugenie Clark, attractive 29-year-old Research Associate of the American Museum of Natural History and probably the only woman who dives underwater to spear marine specimens, recently spent 10 months at Ghardaqa, on the Red Sea in Egypt, collecting rare poisonous fish.

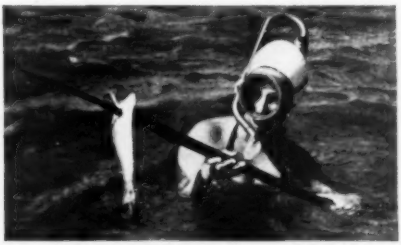


Photo courtesy of American Museum of Natural History

Her researches were carried out at the Marine Biological Station of Fouad University in an isolated spot at the edge of the Sahara Desert. Specimens wanted alive were captured in nets; others were collected by poisoning a partly enclosed body of water. But Dr. Clark says her most exciting experience was underwater spear fishing.

Along with her reactions as a scientist, she responded—with a woman's eye for the aesthetic—to the weird beauty beneath the surface: "It's like a forest of multi-colored trees and plants. The sea anemones, actually invertebrate animals, look more like bright-hued flowers, and marine tube worms with their plumed heads add to the magic of the underwater world."

Dr. Clark had a bad scare, however, when her husband, an orthopedic surgeon, visited her and decided to try his hand at spear fishing. A gigantic barracuda apparently mistook his white sneakers for two small fish and came streaking toward him. Dr. Clark told her husband "softly but firmly" to get back in the boat.

The barracuda went hungry—but the incident spoiled spear fishing for Eugenie Clark for several days thereafter.

Smoke Tunnel Tests Car Design

WHITE smoke blown through a miniature wind tunnel tests the designs of British Bristol cars. The scale model, mounted on a special balance, can be rotated by a turntable to simulate the effect of side winds, while dials measure drag, side force and pitching and yawing tendencies. A tube (not visible) in front of the model shows the speed of the breeze from a fan driven by a six-horsepower electric motor. Close-up at left shows jet pipes that spew the smoke.

75 years ago this month

Popular Science Monthly reported:

"ON SUNDAY, November 26th, Prof. A. Graham Bell experimented with the 'telephone' on the wires of the Eastern Railroad Company between Boston and Salem. Prof. Bell was assisted at the Boston end of the line by two operators, and Mr. Thomas A. Watson by one operator at the Salem end. According to the account published in the *Commonwealth* of Boston, conversation was carried on with Mr. Watson at Salem, by all those present, in turn, without any difficulty, even the voices of the speakers being easily recognized."

Life Guard Rings a Bell

BECAUSE water sometimes has a fatal attraction for children, James H. Robertson of North Hollywood, Calif., worried about unguarded swimming pools. To make them safer, he invented a metal float which he claims will sound off an alarm in the house should anyone fall into the water. Ripples tipping the float cause a bell to ring.

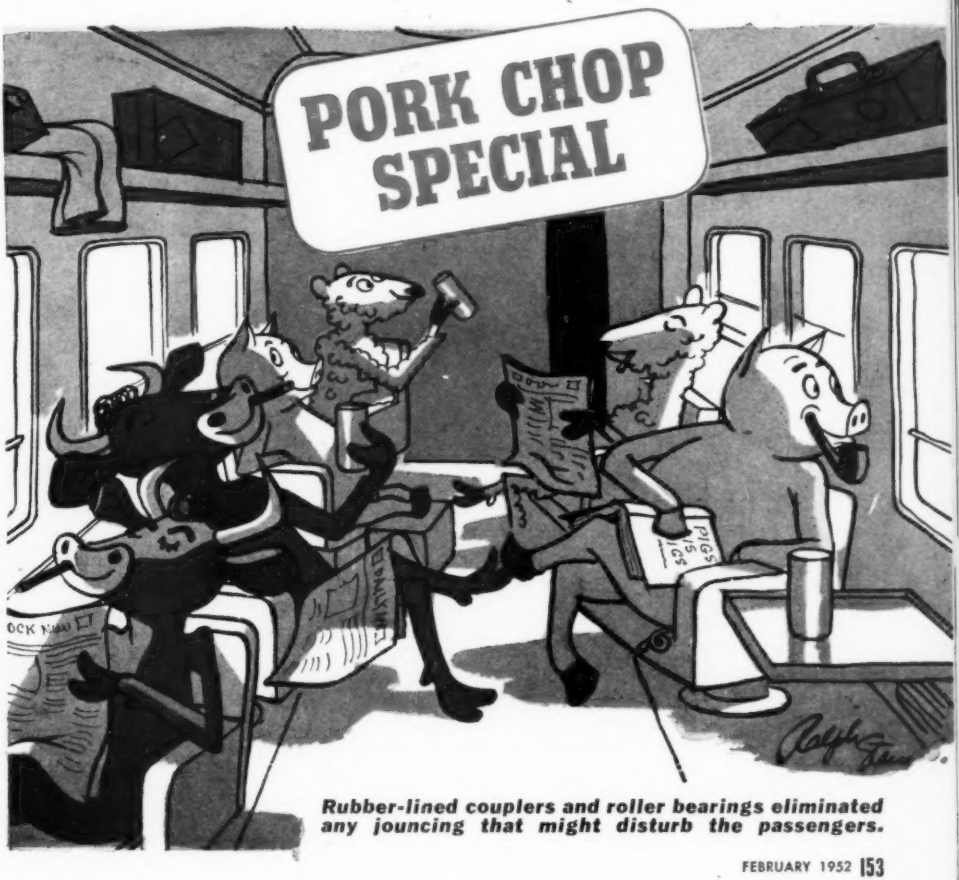
Pampered porkers and contented cows travel to sunny California Pullman-style, but it's just as well they don't know where they're going when they board . . .

America's Fastest Freight

By Andrew R. Boone

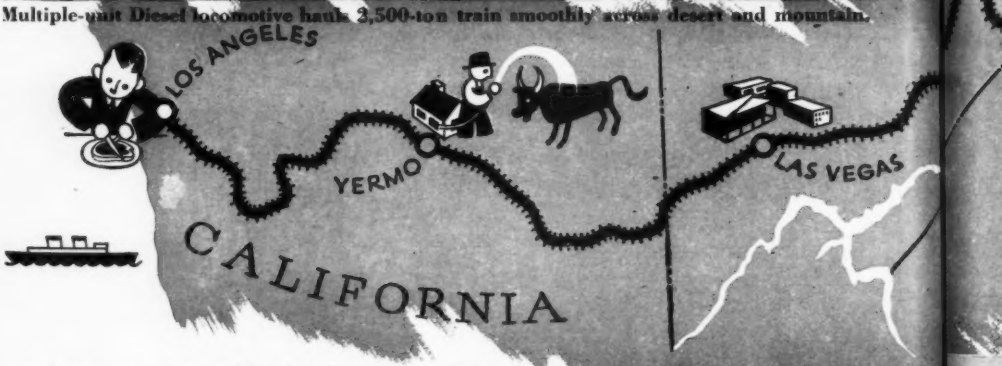
AT 12:29 P.M., Union Pacific's No. 299—the only train of its kind in America—stood in the yards at Salt Lake City ready to roll. Westward-bound for Los Angeles 785 miles away, she had been meticulously checked and serviced, from her gleaming Diesel power plant to her de luxe caboose with its pastel green interior and deep-cushioned seats.

At 12:30 on the nose, the engineer—with specific instructions to avoid any jerks or jolts in getting under way—opened the throttle with delicate precision. Forty-five-hundred horsepower eased the three-quarter-mile-long train forward as gently as a mother wheeling a brand-new baby. As the



Rubber-lined couplers and roller bearings eliminated any jouncing that might disturb the passengers.

Multiple-unit Diesel locomotive hauls 2,500-ton train smoothly across desert and mountain.



cars began to move, rubber-lined couplers absorbed the shock. And as 299 headed for open country and accelerated to a mile-a-minute pace (she was due to pull into L.A. at 3:30 next afternoon), roller bearings and antisway snubbers eliminated any jouncing that might disturb the passengers.

Complaints, however, were unlikely. The occupants of the train's 68 cars were not business tycoons, carefree vacationists or movie actors Hollywood-bound. They were hogs, sheep and cattle—potential pork chops, lamb chops and sirloin steaks destined for the meat markets of the Los Angeles area.

No Train Quite Like It

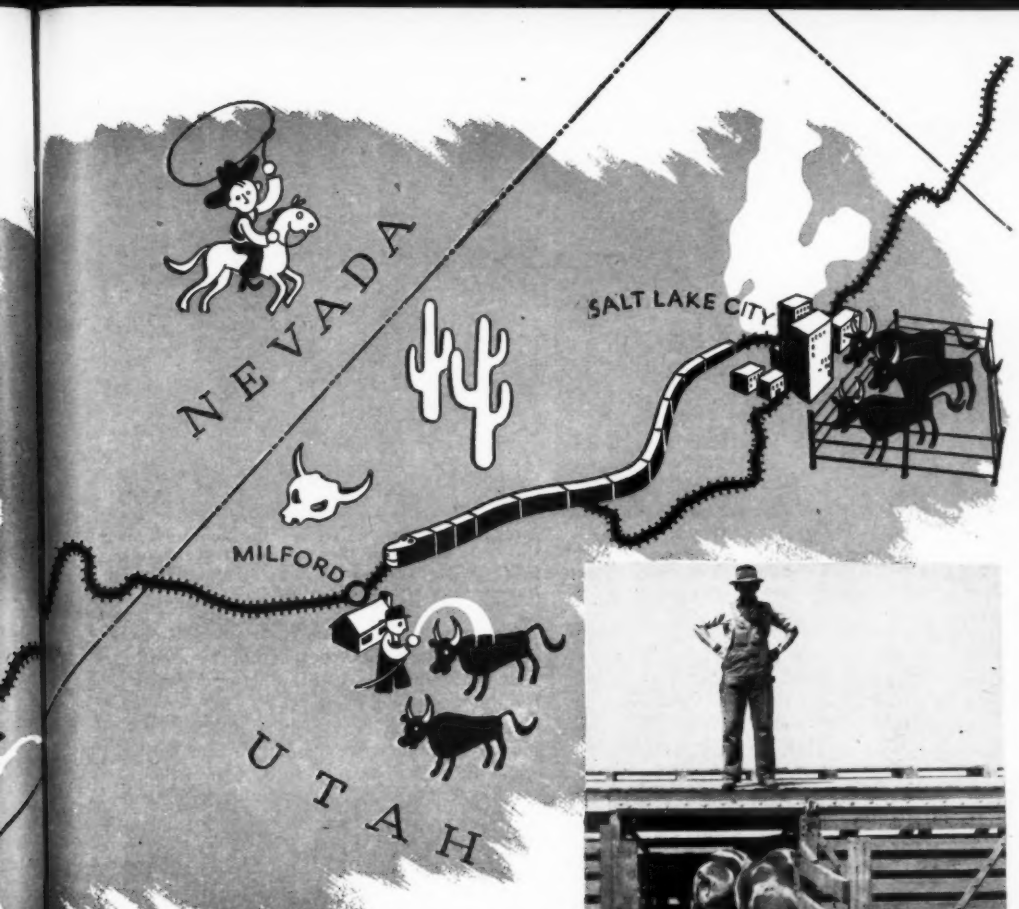
Of all the 17,000 freight trains moving mountains of merchandise every day as they crisscross the 3,000-mile-wide face of the U.S.A., there is none quite like UP's No. 299, known to stockmen as the DLS, short for Day Livestock Special.

In the hierarchy of railroad trains, the DLS occupies a position somewhere between a crack streamliner like UP's City of Los Angeles and an ordinary freight train. Centralized Traffic Control in Salt Lake City will shunt the DLS to a siding to let the streamliner speed past—but the DLS is accorded the same privilege over all other merchandisers.

Permitted a maximum speed of 60 m.p.h.—10 m.p.h. faster than any other freight—the Special has many "luxury" features that smooth the trip for her cargo of filet mignon and ham sandwiches on the hoof.

This unique carrier receives a load of livestock daily at the Ogden-Salt Lake stockyards where they are brought in by other freight trains from Montana, Idaho and as far east as Peoria, Ill. Both single- and double-deck cars are carried—single for cows, double for hogs and sheep. Twenty cattle to a car, about 130 hogs, 200 sheep.

Before the stock are loaded, a four-inch bed of sand is deposited on the floor of each



ALUMINUM PAINT on ends and roofs of cars reflects the heat of the sun and helps keep animals cool while the Livestock Special is crossing the desert.

FAT PORKERS march into upper deck at North Salt Lake. Size determines number—60 to 90 on each deck. These are "top butchers," weighing 180 to 290 pounds apiece.

IN CABOOSE, Trainmaster Wayne Kirkeby, substituting for rear brakeman, keeps a sharp lookout for hotboxes from left side of cupola. Smoking axles are a rarity on the DLS.

A COOL SHOWER refreshes the livestock as the train halts for this operation at Yermo, Calif. Water is squirted onto the sand beds, but not directly on the pigs.

car, to give the animals a better footing. The cars are specially painted to reflect the heat during the desert crossing. And on hot days the stock enjoy a refreshing shower at each of two way stations, when the train is hosed down at Milford, Utah, and Yermo, Calif. And (New York subways take note!) overcrowding of the cars is avoided.

Why all the rush and special provisions?

Well, it seems there is a Federal law which states that animals may not be held aboard a train longer than 28 hours unless the shippers sign a release, and then for only 36 hours. After that, stock must be detrained before continuing their journey.

DLS Is Much More Humane

Before the DLS was put into service, Las Vegas—449 miles southwest of Salt Lake—was the stopping place. Here every head of stock was unloaded, fed and watered—then loaded back on again to continue the trip west. It was a slow business. Drovers—and in the summer, schoolboys—went along as nursemaids for the cattle and hogs. The train ambled along for two and a half days, and many of the stock, jammed into the old-style cars, were bruised and injured. Aside from the humane angle, this meant a heavy loss of meat in the packing house.

The answer was a train fast enough to beat the 28-hour deadline and deliver the goods in prime condition. The DLS does the job. No gravy train for its one-way passengers, it at least gives them a comfortable ride on their way to hog heaven. It covers those 785 miles across Utah and Nevada and over the 3,800-foot summit of Cajon Pass into Southern California in an actual running time of 25 hours 30 minutes.

And the DLS helps fill a vital need. In a hard-working America, people are eating more meat than ever before. The carloads hauled by the DLS have jumped from 14,583 five years ago to 22,216 in 1950. When the figures for 1951 are all in, UP men expect to top that again, with 25,000 cars of fresh meat rolling westward via the Pork Chop Special. END

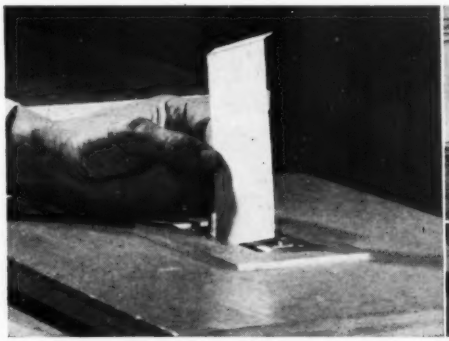
WHENEVER TRAIN STOPS, rear brakeman H. B. Roberts walks back with a flag and a flare to make sure no approaching train sneaks up. He has to hustle to catch the caboose.

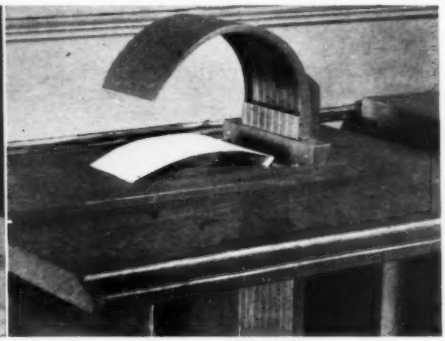
Bus to Check Rays After A-Bomb

DESIGNED to rush to an A-bombed area and report radiation hazards by radio to civil-defense headquarters, Tennessee's new "mobile radiological laboratory" is believed to be the nation's first. The bus has its own power and water supplies as well as instruments (left) to test contamination of air, ground and drinking water.

Messages "Sail" Unwrapped Through Flat Pneumatic Tube

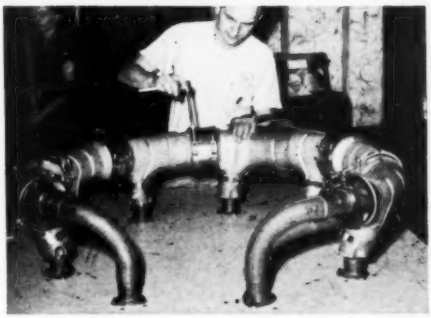
MESSAGES fly through a new pneumatic-tube system without needing to be put in carriers. The end of the stiff paper slip is folded to make a "sail," it goes into the tube (left below), and air pressure speeds it to the receiving end (right below). The oblong tube measures only ⅜ by 2¾ inches in cross section. The first U.S. installation of the German system, made by International Telephone & Telegraph, is in the New York office of the Dun & Bradstreet credit agency. It summons data to answer an inquiry while a customer is still on the phone, eliminating calling back.





Helicopters Using New Metal

SILVERY titanium is finding its first practical uses in aircraft, fulfilling recent predictions of the new metal's promising future in aviation (PS, Oct. '50, p. 146). Formed into complex shapes from flat sheets, it shrouds the exhaust system for a Piasecki helicopter, shown at right being assembled at the San Diego plant of the Ryan Aeronautical Co. Biggest coming use of light, strong and heat-resisting titanium will be for "skins" or surfaces of supersonic planes, say the plant's experts.



Mercury Remodeled

New look in body styling spotlights '52 models,

CLAMP your eyes on a 1952 Mercury and they'll tell you it's a handsome hunk of automobile. Look under the skin, and you'll find some neat engineering tricks that rate more than an admiring glance.

The improvements range from a ladder-type frame to a vacuum-controlled heating system. There's a new air cleaner that fits around—not on top of—the carburetor. Besides saving hood headroom, this cools the carburetor and helps prevent vapor lock. The same concentric design is used on the Lincoln (see page 134).

Overhung pedals are another improvement. All that sticks up on the floorboard are the dimmer switch and accelerator. Clutch and brake pedals are hung from under the dash—no shafts to stub your toe and no floorboard holes for winter winds to whistle through.

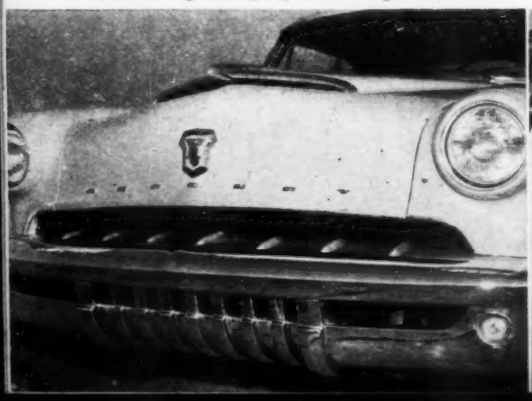
Same Engine, More Compression

Lift the hood and you find the master brake cylinder on the firewall, where you can add fluid or replace a stoplight switch without even getting your knees dusty.

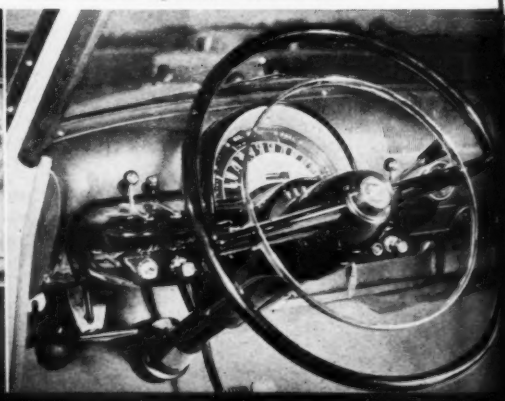
Mercury's V-8 engine has the same L-head design used in 1951 but gets more power from a higher compression ratio and a larger carburetor. Compression is jacked up from 6.8 to 7.2:1. Engineers say the engine does not require premium fuel. It is now rated at

HOOD SCOOP is the tip-off to 1952 Mercurys. This is one of two hard tops. There are two four-door sedans, a two-door and a convertible. Six- and eight-passenger station wagons both have four-door metal bodies with applied wood molding.

IT'S ALL BUMPER. One wide unit eliminates separate radiator grille. Fenders are hood high—you can see both from driver's seat. Recessed parking lights have plastic lenses.



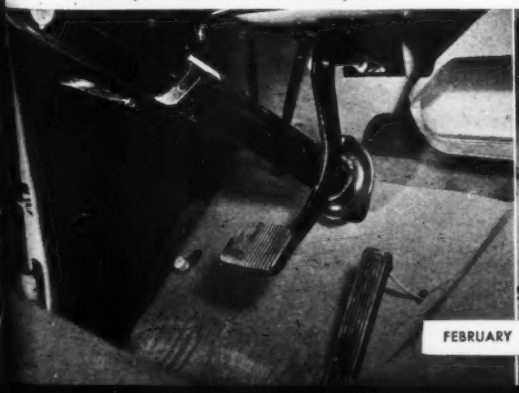
COMPACTLY GROUPED INSTRUMENTS are close around steering wheel. Airplane-type levers in bulge on dash control a new car heater with vacuum-operated thermostat.



Inside and Out

with more horses and other improvements under the hood.

MORE FOOT ROOM, fewer holes for drafts are advantages of pendulum pedal mounting (Mercomatic drive shown has brake, no clutch). This is on Lincoln, too.



CENTRAL FILLER CAP, located under license-tag bracket, can be easily reached by pump hose from either side of car. Tail lights have back-up lights built in.

125 horsepower, 10 more than last year's.

Radically different from the turned-down nose of the '51 is the high, straight-line hood with its swept-back scoop in front. The brightwork on this incorporates the radiator ornament. Although it is a dummy that does not draw in air, the scoop provides a neat recess to cover the top of the radiator.

The inside hood lock has gone the way of the running board. The designers say most car hoods can be opened from outside anyway if you know the tricks. Now both the hood latch and safety catch are released from under the front of the hood.

Outlook Is Better

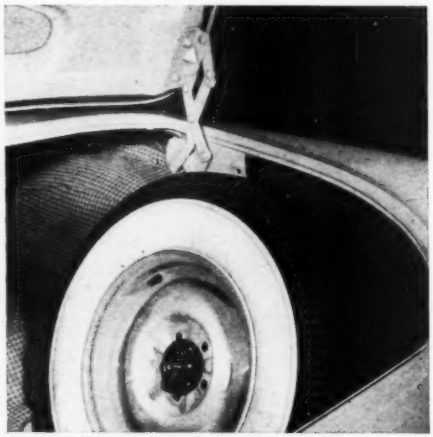
Windshield posts, though thick, are set edgewise to the driver's line of sight. A one-piece curved windshield replaces the divided flat one of last year.

Windows and doors are cut about 1½ inches higher into the roof, making it that much easier to get in with your hat on. The rear window slopes less, affording a wider angle of vision rearward.

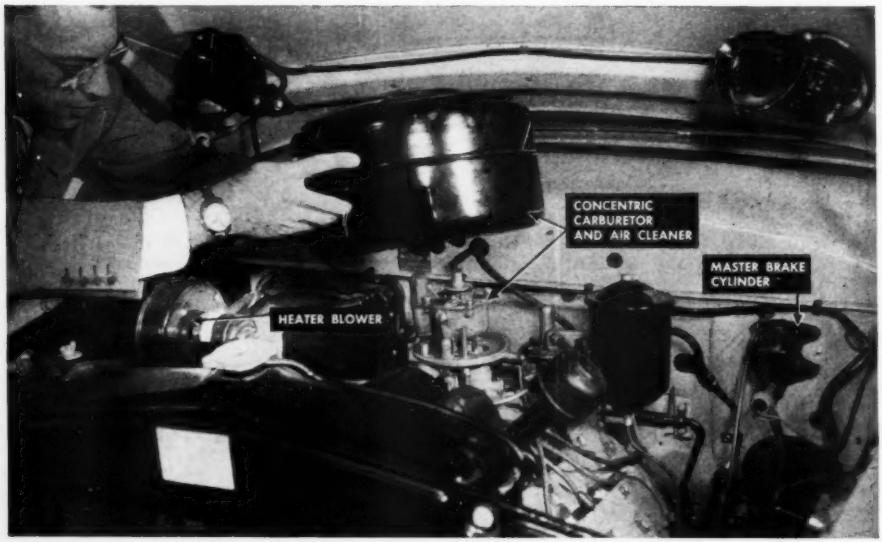
There are side scoops, too. Metal trim sets off rear fenders that otherwise almost disappear into the body. Angled air scoops (dummies, as on other cars) are emphasized by rather wide trim.

The broad-shouldered fenders are probably responsible for a gain of 6½ inches in rear-seat width—it's 57½ inches. There is more than an inch additional headroom in the back of the sedan. Rear doors on the sedan now open from the back, an overdue improvement.

What the man at the pump looks for doesn't show at all. You have to pull down a spring-hinged license-plate bracket to find the gas-tank filler cap. END



PANTOGRAPH TRUNK-LID HINGE has counterbalance springs hidden behind it to save space and prevent marring luggage. Wing nut protects contents from spare-tire bolt.

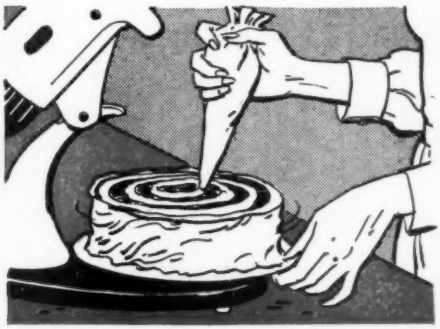


CONCENTRIC CARBURETOR—air cleaner completely surrounds it—is new for '52. Master brake cylinder on firewall is out of road grit, slush and water and is easier to reach.

Keeping the Home Shipshape

THREADS ON A RUG can be picked up easily with this no-stoop gadget. It is a wire-bristled suede-shoe brush fastened to a yardstick. A magnet on the other end picks up needles.

CLOGGED DRAINS in the floor or laundry tubs can be cleared with a length of stiff wire cable chucked in a portable electric drill. Fray out about two inches of the cable end.



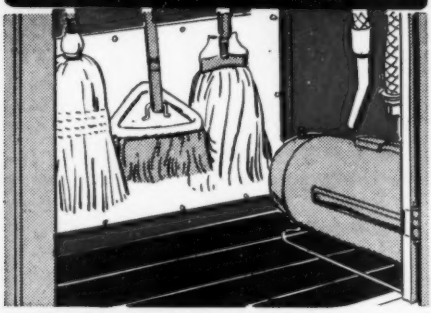
FROSTING A CAKE is an easy job if you have an electric mixer. Placed on the revolving stand, the cake can be turned slowly as icing is applied evenly to top and sides.

LEFTOVER PUTTY can be kept soft if stored in an airtight jar with a little linseed oil. A preserving jar with a rubber sealing ring makes a good container.

KEEP A BALL OF TWINE HANDY in a funnel hung on the kitchen wall. Use a funnel with a gripping tab on the rim. Bend up the tab and screw it to the wall.

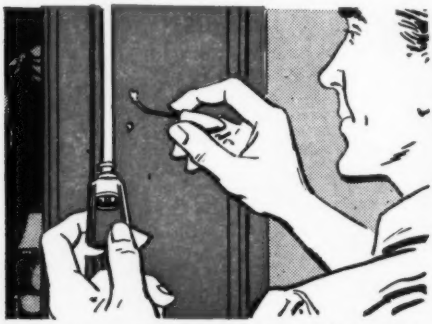
Please turn the page for five more suggestions.

Keeping the Home Shipshape

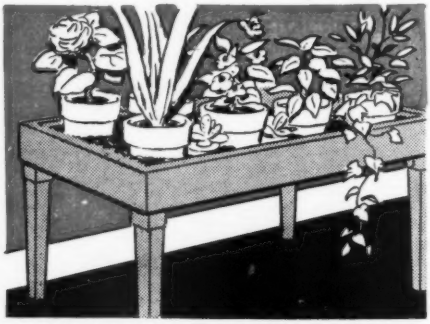


TO PROTECT CLOSET WALLS from oil and grime on mops and brooms, tack up a panel of linoleum, oilcloth or plastic. A damp cloth will wipe it clean.

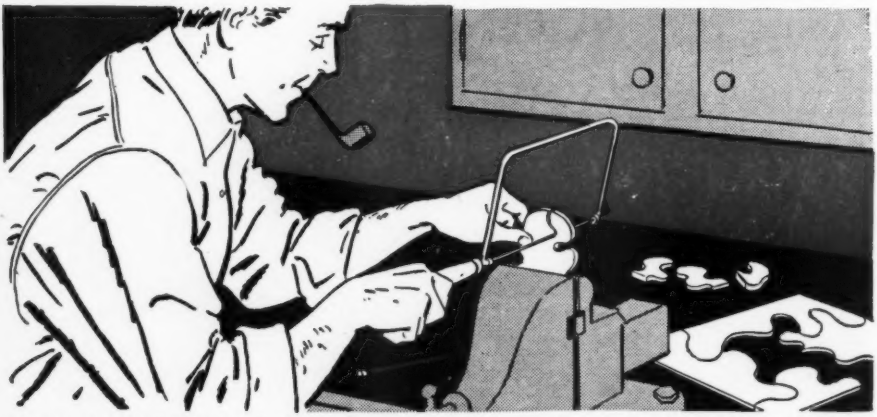
IF OIL OR GUM SEEPS FROM RAW WOOD you want to work with, wipe it away with a rag immersed in turpentine, rub smooth with steel wool and seal with white shellac.



WHEN YOU PAINT WALLS OR WOODWORK, store a bit of the paint used in a nail-polish bottle for touching up chips or scratches. The brush is just right for fussy work.

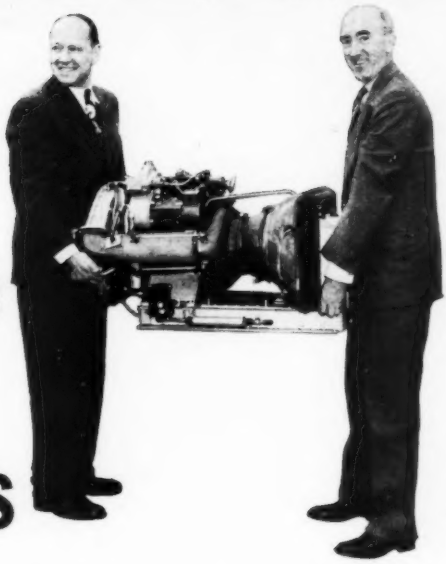


A HOLDER FOR POTTED PLANTS can be made from a piano bench you no longer need. Remove the lid and line the music compartment with zinc, copper or tiles.



SIMPLE JIGSAW PUZZLES of plywood can be made more difficult as a child grows older. With a jigsaw, cut the eight or 10 large pieces into 20, and later into 40 pieces.

200-Lb. Truck Engine Hauls 21-Ton Loads

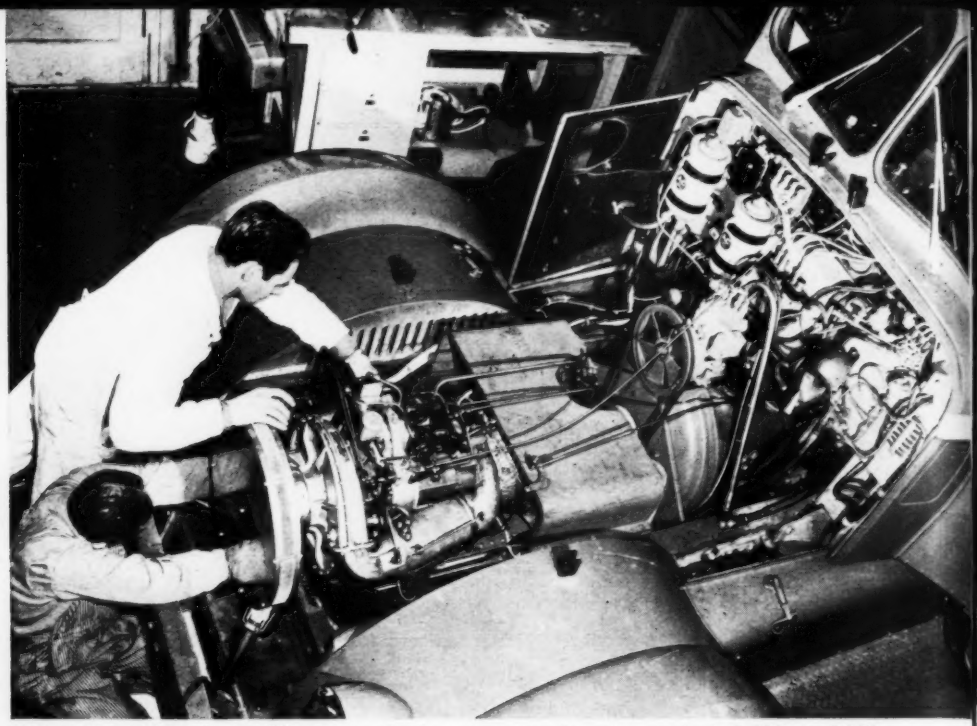


A gas turbine like those that fly the fighters has proved itself on the road.

TOMORROW'S highway trucker is going to be a brother to the fly boys in the wild blue yonder. This seems a sure bet because of the road performance of the world's only gas turbine for trucks. It has now clocked 550 hours of service and traveled 15,000 miles over West Coast highways. Here's the score:

The truck turbine, weighing a scant 200 pounds, has been hauling 21-ton loads as easily as Diesel engines that are 2,500 pounds heavier and seven times bigger.

The turbine engine—the same kind that propels jet airplanes—is silk-smooth and quiet. Gone are the throb of the piston en-



ENGINE IS DWARFED by truck's massive fenders. Engineers hope to offset high fuel consumption by using engine's 2,500- to 3,000-pound weight saving to increase the payload.

gine, the crackle of the exhaust, and pinging.

Acceleration is good.

As compared with a piston engine, the number of shifts can be cut in half. And even a beginner couldn't stall the engine with improper shifting.

With slightly more power, truck jockeys could get "distinctively better" road speeds on hills than they now get with piston power.

All that's on the plus side. The Boeing Airplane Co. of Seattle, doing the pioneering work on turbine propulsion for trucks, is frank to admit that there are some minuses.

One Mile to a Gallon

The first one is high fuel consumption. The test truck gets a mite more than one mile per gallon, Diesels three to five miles.

Another trouble is that turbine wheels, subjected to high speeds and intense heat, wear out pretty fast.

Still another is, for the present, the need for careful gearshifting to keep the turbine at a speed that delivers maximum power on grades.

And finally, the turbine begins lying down on the job in hot weather. That's a basic behavior characteristic of the gas turbine.

Gas turbines for trucks obviously are coming. Whether eventually they will power passenger cars (PS, June '50, p. 98) is a harder question to answer.

But only the defense effort will delay gas turbines for heavy-duty hauling. Boeing's 200-pound midget has been pulling not only that 21-ton load but 13 tons of heavy truck as well—a total of 68,000 pounds.

The company believes that improvements will give its truck turbine a response and flexibility that no piston engine can match. Its 175-horsepower engine, with a seven-speed transmission, has been doing the work of a 200-horsepower Diesel with 12 speeds.

That's because a turbine is a natural torque converter, like the hydraulic converters now used in cars. The only difference: the turbine uses gases instead of fluids.

Cab Is Quieter

Cooling is no problem. The turbine in the truck hasn't even needed a fan. And it is not nearly as noisy as a Diesel. Conversation in the cab isn't difficult at wide-open throttle. The only soundproofing is an air-inlet silencer and mufflers on the two exhaust stacks. Piston engines use both.

SPECIAL INSTRUMENTS, mounted above dash, tell test driver how turbine is behaving. Driver's job is made easier by absence of staccato exhaust, knock, and engine shake.

The turbine uses practically no lubricating oil. Its capacity is only four quarts.

The few but important ailments afflicting the gas turbine can be doctored, say Boeing engineers.

Fuel consumption, for one thing, will come down. Reducing friction losses and raising the turbine's thermal efficiency—the amount of energy it extracts from its fuel—will help. So will designing a lighter truck chassis and engine installation to match the flyweight engine. Fuel costs can be brought down with cheaper fuels—a turbine will burn almost anything except cordwood.

More Horsepower to Come

Better turbine wheels and blades, already being made, will cut repairs. Some of Boeing's trouble, the engineers found, was high-frequency vibration. That has been mended. "Heat shock" to the turbine blades when a driver poured on the coal too fast was fixed by putting the equivalent of a governor on the accelerator.

Building an engine a bit larger to get an output of nearly a third more horsepower will take care of the need for careful gear-shifting to maintain power on hills, and the loss of power in hot weather. END

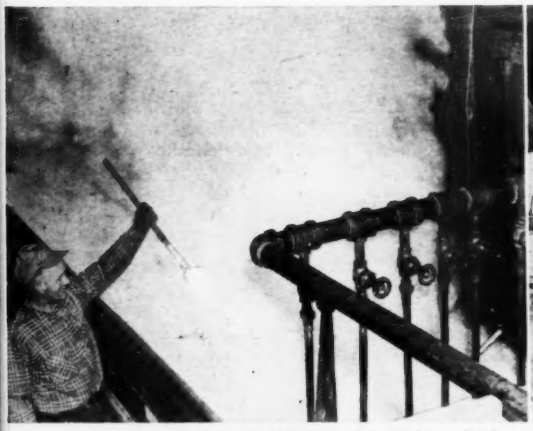
TWIN EXHAUSTS carry away fumes. In test rig, right angles in ducts created back pressure in exhaust gas, lost 10 to 15 hp. Each stack has nonrestricting-type acoustic muffler.

STEAM FROM BOILER in nearby concrete pit passes into evaporator through six feed lines and circulates through 416 feet of copper tubing. Tubing is raised slightly so sap flows around it for faster boiling.

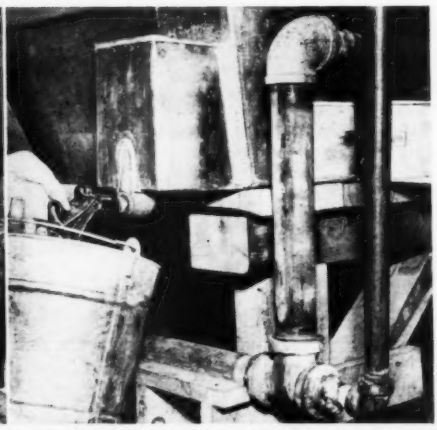
Old-Time Maple Syrup Made by Steam Heat

CUTTING and hauling cords of wood to an open fire for boiling down maple sap is just a memory at Martin A. Brown's farm near Wilmington, Vt. His maple syrup is made with steam heat.

An oil-fired boiler like those used in dairy plants provides the heat that boils the sap. It is a recirculating system. The heating steam is condensed and flows back to the boiler to get steamed up again. On the way back, it flows through a pipe that preheats the incoming fresh sap so that it reaches the boiling point sooner. Steam keeps the sap at a fast boil with no danger—as over a wood fire—of scorching the thickening liquid.



WORKER TESTS THICKNESS OF SAP, which comes to a boil in 15 minutes. Steam enters vat through pipe in foreground above. It takes about 35 gallons of sap to produce one gallon of syrup—rest boils away.



SYRUP IS DRAWN OFF EVAPORATOR. Large pipe above feeds in sap from storage tanks. Smaller pipe returns condensed steam to boiler for re-use. Running hot-water pipe inside sap pipe part way preheats incoming sap.

Tiny Cardboard Capsule Serves as Photoflash Bulb

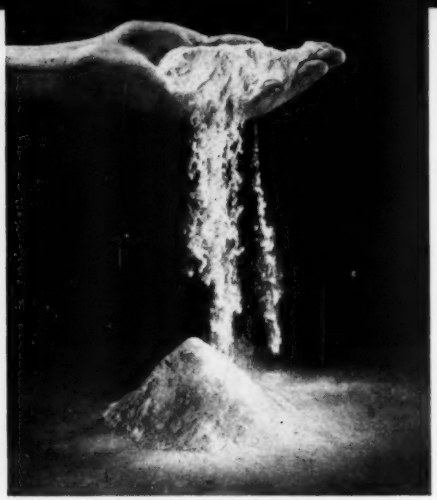
THIS little pronged button does the work of a flash bulb but costs a lot less. And a photographer can carry enough buttons for several dozen shots in his coat pocket.

Marketed in England, the sealed capsule holds smokeless flash powder and a fuse for firing it electrically. It plugs into a special adapter that fits any standard flash gun. A tiny lamp in the adapter lights up if current is on in the flash gun, warning the user not to insert the flash button until the switch is turned off.

By Harland Manchester

ON MANY thousands of clotheslines throughout the Midwest and in parts of the East, the Monday wash is getting whiter and whiter with less and less scrubbing because of a new soil-resistant chemical, CMC, which seems destined to become an important aid in laundries everywhere.

This new enemy of dirt is a fine cellulose powder made from cotton or wood pulp. It feels like flour when rubbed between the fingers. It is odorless, tasteless and so nontoxic that you could even eat it. Mixed with water, it forms a smooth syruplike solution ready to add to the final rinse in either automatic laundries or the washtub. It puts an invisible protective coating on the fibers



ODORLESS, TASTELESS AND NONTOXIC, CMC is a white, granulated, free-flowing powder. Supply is limited only by size of cotton crop which is its source.

SYRUPY SOLUTION of CMC ready to put in laundry rinse water is made by adding hot or cold water to powder. Consistency is indicated by photo, shot at 1/30,000 second.

of the garment, which makes the cloth harder to soil. In the next wash, this coating dissolves like magic, ridding the garment of dirt and grease in a fraction of the time usually needed, and with little or no scrubbing.

While CMC—the chemical name is sodium carboxymethylcellulose—has been known for some time, its ability to protect fabrics against soiling was discovered only two years ago by Dr. Jack Compton of the Institute of Textile Technology, a Charlottesville, Va., research center supported by the textile industry. The discovery came about as a result of a survey by the U. S. Department of Agriculture. Hoping to build up the position of cotton versus the synthetic fabrics, the USDA questionnaired thousands of housewives: "What is there about cotton cloth that you want improved?" Many replied that they wished cotton wouldn't soil so easily. The USDA turned the problem over to the Institute.

Cotton Fibers Trap the Dirt

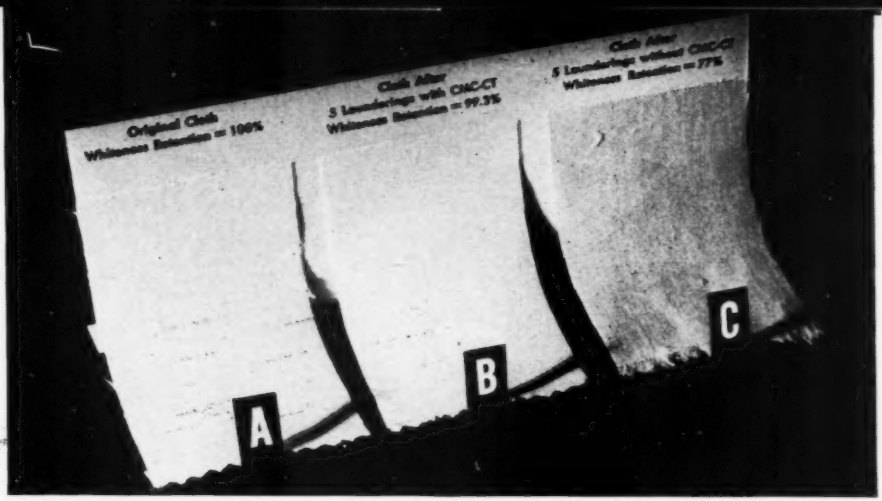
The research men's first job was to find out exactly how cotton cloth gets dirty. They soiled samples of cotton, looked at them through a microscope, washed them and examined them again. They found that soil particles were trapped by the irregularities in the fabric and fiber, and that the first particles thus deposited formed a beachhead which made it easy for more dirt to accumulate. The only solution, it appeared, was to find a substance which would coat over the rough places that hold dirt, so soil particles could not find an easy lodging place.

Dr. Compton tested a score or more of compounds, including synthetic resins and water-repellent chemicals. All were discarded for one reason or another. Then he hit upon CMC, which was discovered in Germany some 50 years ago, used extensively there during the war as an ingredient of washing powder, and brought to this country by American scientists who were sent to survey German technology at the close of the war.

Science Invades the Laundry

Compton and his staff took two clean pieces of white cotton cloth, rinsed one of them in a solution of CMC and left the other untreated. After drying, they rubbed them both thoroughly in lampblack and other soiling agents. Their first discovery was that it took much more dirt to make the treated sample as black as the other one. Then they washed each sample in soapy water. Naturally, it took plenty of elbow grease to wash the untreated cloth. But the water turned suddenly black when the CMC-treated cloth was immersed, and in a few seconds the cloth had regained its whiteness, making the other sample look gray by comparison.

Hundreds of other tests followed. In all cases, the CMC-treated fabrics were harder to soil and easier to wash, and it took much less soap or detergent to get them clean.



WHAT CMC DOES: Swatch *A* represents fresh unlaundered cloth of 100-percent whiteness. Swatch *C* shows how cloth looked after five washings with an ordinary detergent. Swatch *B* shows what happened when CMC was added to detergent—less than one percent loss of whiteness as measured by instrument, no apparent loss to the naked eye.

A motion-picture film taken through a microscope gives a dramatic close-up of CMC at work. When water hits the cotton fibers, shown magnified to the size of cables, a series of "explosions" takes place as the transparent CMC jacket encasing each fiber suddenly dissolves. Dirt particles fly in all directions and, held in suspension by the liquefied cellulose, are flushed from the cloth, which resumes its pristine whiteness.

Mothers of Small Boys Like CMC

Laboratory results were so promising that Dr. Compton distributed CMC to Charlottesville housewives, along with instructions for use. "Tattletale gray" disappeared from dozens of washlines, and enthusiastic reports poured in. A mother of three schoolboys had always had to give their clothes special scrubbing at the knees, seats and collars. When she began using CMC in the rinse, the badly soiled areas no longer needed special attention. Because of the protective action of the CMC film, she now uses only one-fifth as much synthetic detergent in her automatic washing machine. And she has dropped both bleach and bluing without impairing the whiteness of her wash.

Since CMC resists grease and oil, the treatment is a natural for overalls and other work clothes used in messy jobs.

Treated with CMC, white socks remain permanently white, and cotton socks wash as easily as nylon.

All five of Charlottesville's commercial laundries, as well as one in Washington, D. C., and one in New Jersey, have been using the new soil-resistant chemical, to the great satisfaction of their customers. John Minor, president of Home Laundry, Inc., in Charlottesville, has been using CMC in the final rinse for nearly a year, and the increasing whiteness of sheets, towels, tablecloths and shirts is so apparent that you can walk through his plant and tell the difference between new customers' bundles and those of the old ones.

A Boon for the White-Collar Man

While CMC appeals primarily to housewives, it is a great boon to the American male in his most sensitive sartorial problem —the appearance of a soft white shirt.

About 75 percent of men insist on a little starch in the collar to help shed dirt and to prevent early wilting. But starched collars wear out faster and develop irritating saw edges.

On the other hand, the 25-percent stubborn minority wage a constant battle to keep starch out of their shirts. They avoid neck rash and their shirts last longer, but toward the end of an office day they look like the character in the ads who doesn't get the girl.

CMC makes both factions happy. Members of the Institute staff who like their shirts starched brought in about sixty shirts

[Continued on page 268]

Mirror reflector at end of projector's light barrel beams ads on banks of clouds at night.

Sky Ads Shot from "Rocket"

THE only thing these Buck Rogers characters and their "rocket ship" put into the sky is an advertising sign. The "rocket" is really a giant slide projector that uses clouds for a screen. The 36-foot long, 2½-ton Astralux machine has a mirror at one end to reflect its message on clouds at night.

When beamed to a maximum altitude of 16,500 feet, the message can be read eight miles away under proper weather conditions—the German makers claim. A 300-ampere, 100-volt generator sparks an arc light of 4,500,000 candlepower.

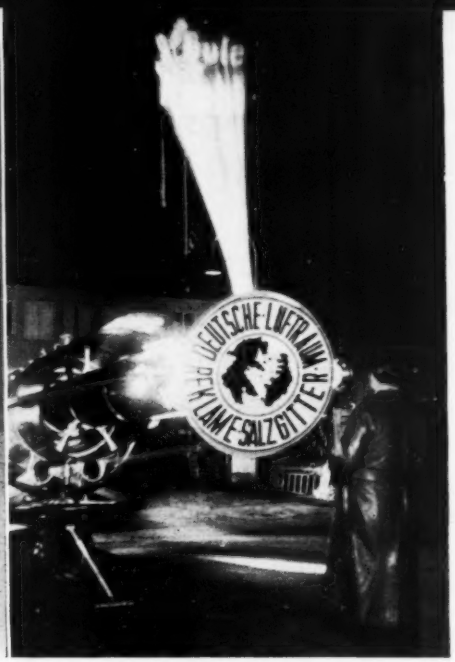
Tractor Has Overhead Valves

THIS new English tractor gives farmers a choice of three types of engine—gasoline, kerosene, or Diesel. All are overhead-valve, four-cylinder engines that are designed to use many parts common to all three. Other features of the new Fordson Major include: grouping of controls on the dash, car fashion; a new type of hydraulic lift, and adjustable track widths.

Spray Stops Static Shocks

WHEN you slide in and out of a car having plastic seat covers you can generate enough static electricity to get a mild jolt if you touch metal. Spraying the covers with Stop Shok, a colorless, stainless compound shown above, is said to eliminate such shocks. The maker, Electro-Chemical Products Corp., East Orange, N. J., claims the conductive coating bleeds off all static.

SLIDES ARE INSERTED from outside through an air vent in the machine. Special clothing and asbestos gloves protect worker against intense heat from electric arc.



SLIDE IS PROJECTED here at a steep angle. When beamed to an altitude of 3,300 feet, an area of 225,000 square feet is illuminated. It can reach altitude of three miles or more.

Fast Truck Fights Plane Fires

WITHIN 3.3 minutes, the Air Force's new crash truck can travel two miles to a blaze and shoot 300 gallons of water foam at it. An outsize engine makes the zero-to-60 acceleration in 61 seconds. The Marmon-Herrington truck has a remotely controlled turret nozzle on the cab roof to attack fires from above, three sweep sprays to hit at ground level and extra lines intended for use by hand.

Desert Posse Mounts 45 Jeeps

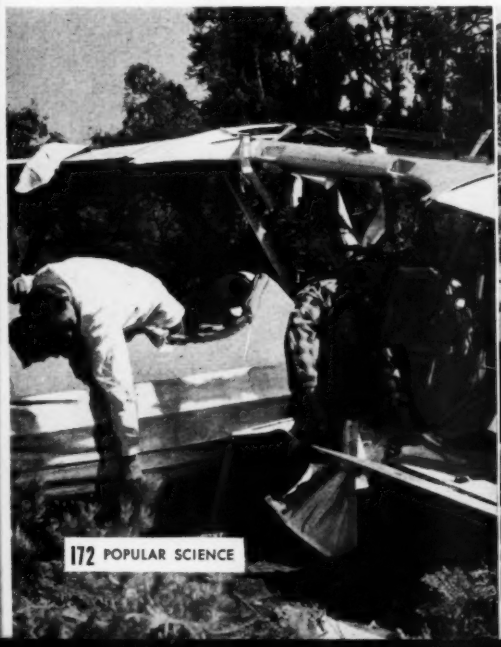
WHEN a plane crashes in the craggy desert country of Clark County in southern Nevada, a posse of jeep-riding rescuers is soon bumping its way to the wreck. There are 45 of the rugged little cars in the posse, a volunteer outfit. Each is driven by its owner. With him rides a man trained in some specialty such as map reading or car repair. Both men are able to give first aid.

If the West Coast should be bombed, the Clark County Jeep Posse will have an important civil-defense job—guiding and helping to treat injured and frightened refugees fleeing inland. Now, when called, they not only rescue plane-accident victims but help the sheriff and his mounted deputies beat the sagebrush and scour the canyons for lost persons and escaped criminals. Most of the country they cover was formerly accessible only on foot or on horseback.

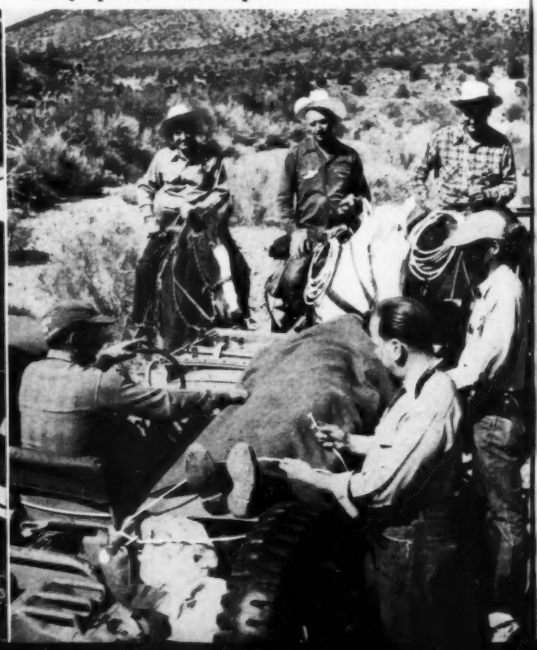
The men practice frequently for the real thing. One such mission took 16 hours, left jeeps damaged and posse exhausted.

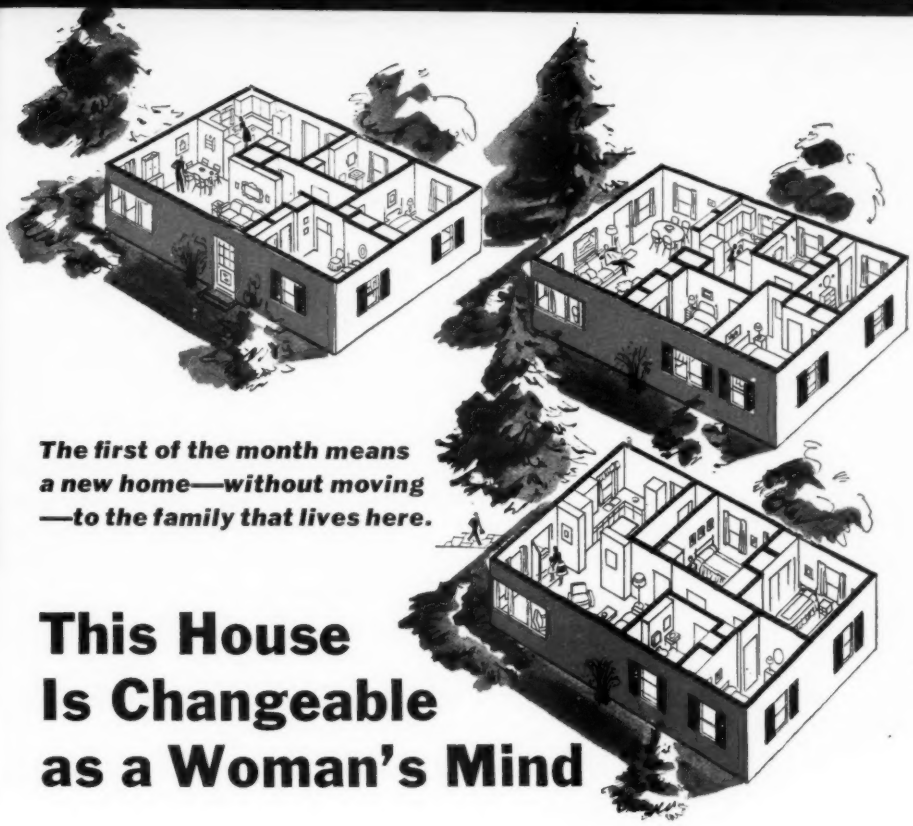
POSSE WAITS FOR A MAP to be dropped from a plane of the sheriff's aero squadron. Pilots spot the objective, make a crude sketch and toss the drawing down. Even then it's hard to find the way in the rough country.

THE PLANE IS REALLY A WRECK but the "injured" are faking. They climbed into it where it lay crumpled at the summit of steep cliffs. Even though guided by planes, the jeeps spent eight hours reaching scene.



STRAPPED TO A JEEP, an "injured" man from the wrecked plane is about to start his rough journey to town. The men on horseback are in sheriff's official posse, who often call on the jeep riders for help.





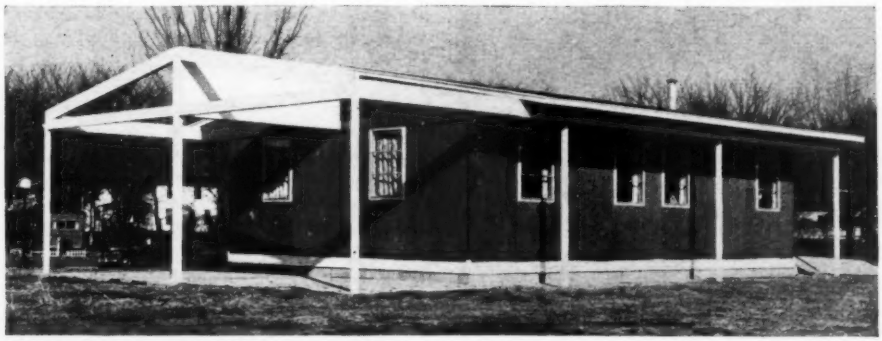
The first of the month means a new home—without moving —to the family that lives here.

This House Is Changeable as a Woman's Mind

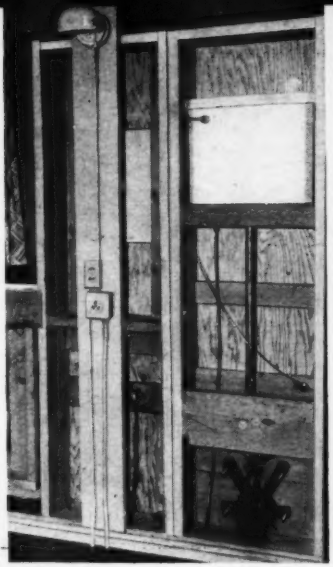
By Hartley E. Howe

EVER get bored with your house and wish you could reshuffle the rooms—say put the kitchen where the front hall is and swap the bathroom and living room? There's a house in Urbana, Ill., where you could do just that, any time you wanted to, in a few hours. In fact the family living there finds itself with a new room layout each month.

The house that's as changeable as a woman's mind was built by the Small Homes Council at the University of Illinois in an attempt to learn how to design more efficient homes. Not only can the room plan be quickly rearranged by a couple of men—three possible plans are shown above—but windows and doors can be moved around and the



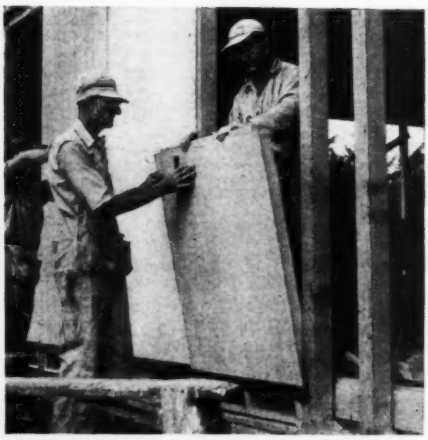
EXPOSED ROOF TRUSS and skeleton rafters at end, extra wide overhang at sides, are all that show house is expandable space lab. Columns at outer edge carry whole roof weight.



FLEXIBILITY OF INTERIOR is shown (left) by erection of partitions—solid panels of three layers of wallboard, held by nailing strips at top and bottom. Center picture shows back of boxlike wall units that carry toilet and washbowl and their plumbing. Whole unit can be moved in one piece. At right, prebuilt closet unit is slid into place in wall.

whole house made larger or smaller at the drop of a blueprint.

Naturally, no ordinary house can play tricks of this sort. The Small Homes Council call their creation a "space laboratory." Designed by Prof. Rudard A. Jones in consultation with other Illinois faculty members, the building looks like any modern small home at first glance. The house beneath the skin, however, is radically different:

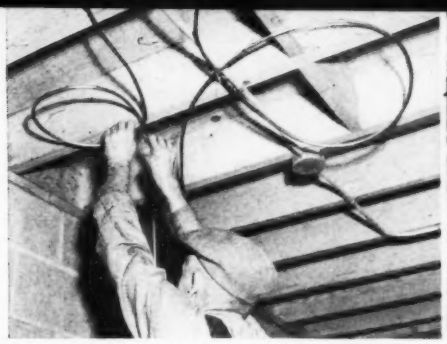


OUTER WALLS carry no weight. Prebuilt panels are fitted between nailer posts fastened to sill and plate. Window and door units are also easily shifted.

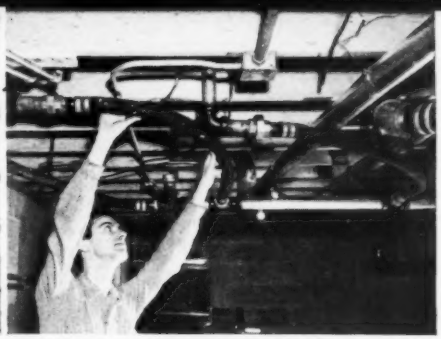
- The roof was built first and is completely independent of the walls.
- Since the walls carry no load, they can be rearranged at will.
- The base slab is 32 by 48 feet, well beyond the wall line of the present 24-by-36 house. Floors can be enlarged with panel units.
- Walls and partitions are made in panels that can be shifted with minimum work.
- Kitchen counters, appliances and cabinets are merely set or hung in place.
- Wiring is in exposed raceways.
- Extra coils have been left in the water-pipe lines—flexible copper tubing—so they can be extended.
- Waste lines are connected to the main house drain by flexible hose.
- Bathroom fixtures are set in box panels so each can be moved with its plumbing.

Living Conditions Have Changed

The housing experts who conceived the space lab have a couple of basic ideas they want to check on. One is that modern household appliances and changing living habits have combined to outmode traditional house layouts. The other is that surveys of housing needs based on asking people what they want are pretty unrealistic. When interviewed, people tend to ask for a higher standard of housing than they are willing to pay for when the chips are down. At the same time it's hard for people to tell what



EXTRA COILS in flexible copper tubing that carries water to kitchen, bathroom, laundry, permit fixtures to be moved to different parts of house without laying new pipes.



FIRE HOSE connects fixture drains to house master drain, so units can easily be moved and reconnected. Note small, easily relocated ducts of hot-air heating system.

kind of a house they would like until they have had a chance to live in it.

So this Illinois study does not concern itself with dream houses but with the house the family is actually living in—and it's a different house every 30 days. To keep track of how people live in it, the space lab is filled with measuring devices. A pair of electric eyes count the number of times someone goes through the doorways between living room and kitchen, and living room and bedrooms. The housewife wears a pedometer to record how many miles a day she walks in her daily routine. At the end of each month, all members of the family are interviewed about the efficiency of that month's layout and how they liked living in it.

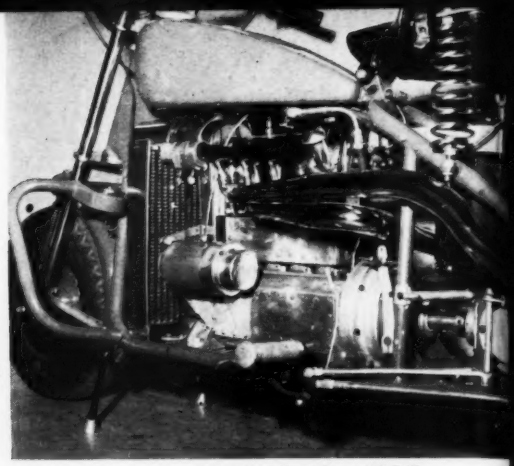
Family Picks Own Layout

In return for acting as guinea pigs, the two families who are spending six months apiece in the house live there free except for utilities. Each family has been chosen as average—a couple around 30 with two children, a boy and a girl, one in school, one preschool. For the last month of their stay, the tenants will pick the layout they themselves would like to try. Some of the other layouts will be based on a study of homeowners' comments on their present houses, so that a cross check will be obtained.

Sociologists and home-economics experts at the University are cooperating with architects and builders in the study. The results will be compared with earlier surveys based on interviews. The final report, the Small Homes Council hope, will tell a lot about the most efficient—and most livable—arrangement of both household equipment and living space. The goal is a house tailored to meet the *real* needs of the people who are going to call it home. END

KITCHEN COUNTERS AND APPLIANCES are just set in place, can be moved without tearing anything out. For same reason, kitchen cabinets are hung on walls without fastenings.

BATHTUB IS ON WHEELS so that it can be moved to any part of house with minimum of bother. Tub plumbing assembly is boxed like those of washbowl and toilet.



ALL HIS. Smaller, 215-lb. cycle (left) was entirely designed and built by Forrest. Engine (close-up above) has shaft machined from single steel billet. It is water cooled by thermosiphon action from tiny radiator. Piston displacement is 19.2 cubic inches; bore, 1¾ inches; stroke, two inches. Lubricating oil is force fed.

Bike Designer Rolls His Own

WHAT does a motorcycle designer do when he isn't busy in his office designing motorcycles? Why natch, he goes home and designs more motorcycles, builds motorcycles in his shop and rides around on —you guessed it—motorcycles.

Witness Howard Forrest, who spends his working hours as a designer for the Mustang Motorcycle Corp. of Glendale, Calif. His spare-time hobby for the past 4½ years has been building this pair of special bikes. His particular pride is the smaller of the two (top), powered by a four-cylinder, in-line engine of his own design.

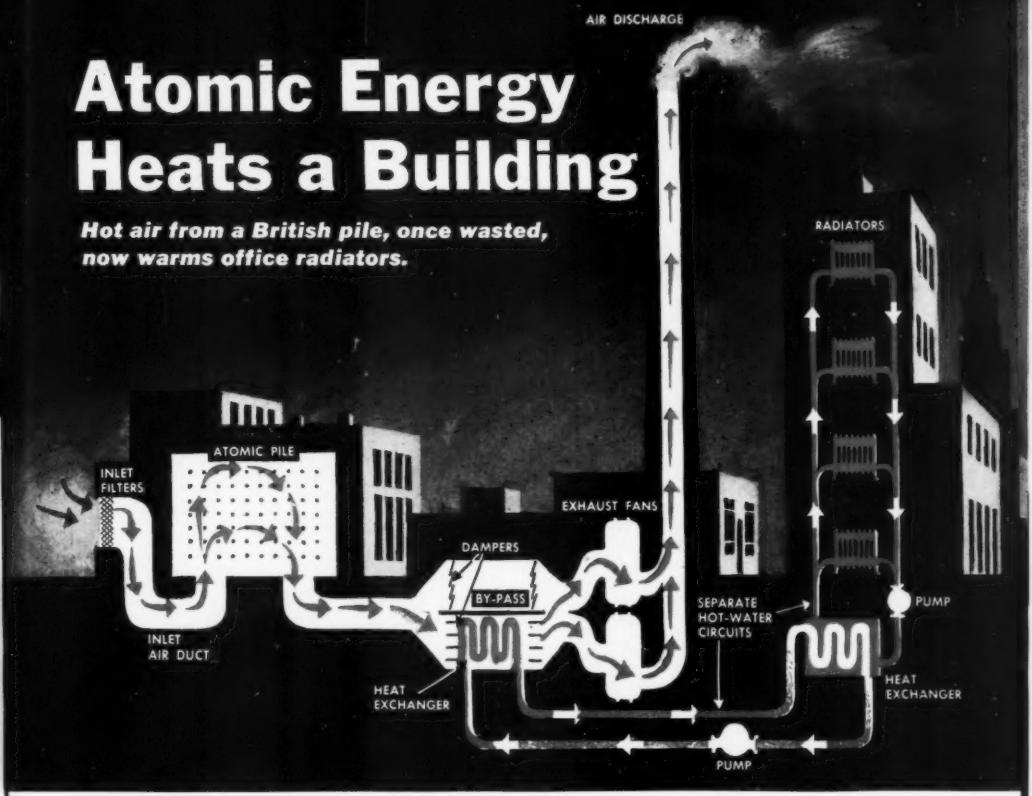
Forrest's larger, 290-pound machine was built to his company's specifications around a 1931 Ariel Square Four engine. It has wire wheels specially built for it.

The designer hasn't measured the bikes' gas mileage to the ounce, but he rides one or the other to work in good weather and finds that either can make almost four round trips between home and office—seven miles each way—on a gallon of fuel.

CREAM-COLORED BEAUTY, designed around 25-horse engine, took nearly a year to build. It has overhead single camshaft, twin exhausts, foot-operated four-speed transmission.

Atomic Energy Heats a Building

Hot air from a British pile, once wasted, now warms office radiators.



Double exchangers extract heat—but no radioactivity—from atom pile to warm nearby offices.

ATOMIC energy has passed another milestone—its first practical application outside the fields of medicine and weapons. The world's first atomic-powered heating system has gone into operation at Harwell, England, center of British atomic research.

The heat is generated by "Bepo"—one of the Harwell atomic piles—in the course of its normal operation. Up to now this heat has not only been wasted but has cost money, since an air-cooling system is needed to keep the pile at its proper temperature.

Now an eight-ton heat exchanger has been installed at the outlet of the air, which has been heated to 135° while cooling the pile. The exchanger takes this heat and uses it to warm water to 130°. This hot water is then pumped to a second exchanger where it heats the water that circulates through the radiators of a 330,000-cubic-foot building that houses 80 offices. There's no chance for the radiator water to become radioactive—in fact it can safely be used for washing.

Temperatures will be increased when the pile is modified this year. The amount of hot air fed into the exchanger is regulated by a by-pass with a damper to suit the heat demands of the building. The present heat output of 1,000,000 BTU an hour is only a seventh of the rate planned when the system is completed. Eventually the heating circuit will be extended to two or three more buildings in the research center.

The present installation cost about $42,000, but it is estimated that it will save about $7,500 a year in reduced fuel bills. But don't start figuring the savings for *your* house—unless you have an atomic pile handy for a furnace!

It's a Small World

OUR solar system, as far out as the planet Saturn, could easily fit inside the largest star in the sky. With a diameter of 2,500,000,000 miles, the star lies in the constellation Auriga. It gives off practically no visible light.

P.S.

Last minute news & notes...

THEY'RE PUTTING WINGS ON SHIPS, but not to make them fly. The Cunard liner "Media" will be the first passenger vessel in North Atlantic service equipped with anti-roll stabilizers, like those developed by the British Navy during the war. The stabilizers are movable flaps that can be extended, under water, to reduce rolling in heavy seas.

NEW KIND OF MOVIE FILM is exceptionally tear- and shrink-resistant, thin enough to provide more footage per reel and less flammable than present safety bases. Developed by du Pont, the base is a synthetic related to Dacron fiber.

DOGS WITH BAD BREATH or an embarrassing tendency to smell too much like dogs can now take heart. Relief is available for them--and for cats, too--in the form of liquid chlorophyll. One teaspoonful, stirred into the main meal of the day, is said to make any dog or cat able to face life unafraid within 12 to 18 hours. Big animals require bigger doses, naturally.

A NEW LOCOMOTIVE for the Pennsy is a regular "substation on wheels"--it draws AC from an overhead wire and converts it by mercury rectifier tube into DC for its motors. One of four being built by Westinghouse, it is expected to have the speed of AC electrics, yet develop 47 percent more tractive effort for easier starting under heavy loads.

ALL LIVING PLANTS are wiped out by a new chemical named CMU. Intended as a weed-killer, it could also be a potent biological-warfare weapon against enemy crop plants.

REFRIGERATORS can now defrost themselves speedily without eating up power to run electric heating elements. Every 24 hours a timer sends warm refrigerant back to the freezing unit instead of to the condenser, where it would normally give up its heat to the outside air. Frost melts from the inside out, and the food compartment stays cold meanwhile. Called the "magic cycle," the innovation is built into two 1952 Kelvinator models.

A BIG CONTRIBUTION to astronomy in 1951: computation by an electric "super-brain" of accurate new tables that tell the position of Jupiter, Saturn and more remote planets at 40-day intervals up to the year 2060. Inaccuracies in previous tables, growing more serious with passing time, would otherwise have started to throw off ship and plane navigators in a few more years.

TWELVE-VOLT ignition systems are forecast for U.S. cars. Present ones of six volts are proving inadequate for high-compression engines, says H. L. Hartzell, Delco-Remy engineer. A 12-volt system should give hotter sparks, faster cranking speeds, higher output from a generator of the same size and better operation of motors in accessories.

CURRENT COMMENT

"IMPROVEMENT in production methods may offer even greater opportunities than new materials or processes." (Prof. F. K. Shallenberger, Stanford University)..."As our areas of knowledge enlarge into the space of the unknown, the domain of our ignorance extends steadily beyond." (Dr. W. O. Roberts, High Altitude Observatory of Harvard University and the University of Colorado)..."The progress of mankind can be read in the record of the achievements of its engineers." (Dr. Earle S. Ebers, U.S. Rubber Co.)

AN ANTIDOTE may have been found for poisonous beryllium, formerly used in fluorescent lamps and still considered a promising atomic-pile metal. Successfully tested on animals, an organic acid called ATA turns beryllium into a harmless red compound.

The Editors

TV star Norman Brokenshire shows his neighbor, Doreen Wilson, how to remodel an old lamp.

How to Improve the Lamps You Have

Simple changes make reading and working easier on your eyes.

SURE, you like the lamps you have—or you wouldn't have them. But many of them may not be putting out the right light in the right places for easy, healthful seeing.

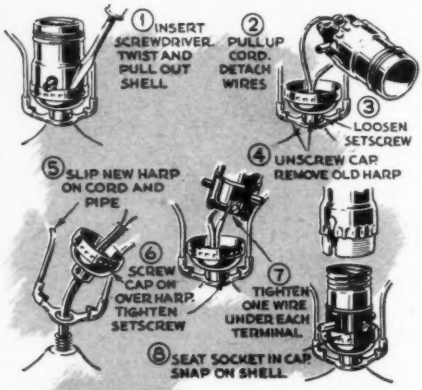
Modern "functional" lamps come in fancy designs with fancy price tags. But the indirect bulbs, circular fluorescents, diffusers and three-way sockets that make them efficient are all available as accessories. By using the right attachments, you can bring the lamps you have up to date—and at a fraction of the cost of new ones.

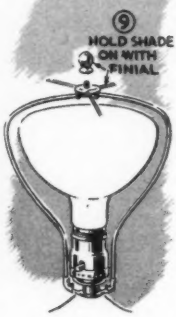
The next four pages show you step by step how to make ordinary lamps more effective and how to place them to put their best foot-candles forward.

SPOT A TABLE LAMP like this for good reading light with no distracting glare. (If yours isn't high enough, see below.) A 32-watt circular fluorescent tube plus a 150-watt bulb is recommended by General Electric Co. for such a lamp. Or use a wall lamp, placing chair so your book is 15″ to right or left of the shade's center and 26″ in front of it.

IF LAMP IS TOO LOW, as at left above, it funnels light downward, leaving chair in semi-darkness. Same lamp at right, raised on a wooden block, with inside of opaque shade coated with white water paint and 150-watt indirect bulb installed, gives ample light.

For Your Favorite Chair



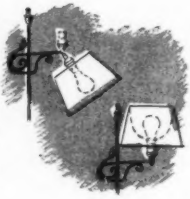


INDIRECT BULBS won't fit old-fashioned narrow harps. Follow these easy steps to install the wide harp needed. Some lamps are held together by a pipe running through the base, body and top. Be careful in disassembling these to keep parts from falling off the pipe and breaking. Some one-piece ceramic bases have no pipe, but only a short nipple at the top. You may have to hold it inside base to unscrew the old socket.

For Homework or Letter Writing at the Desk

USE ONE TABLE LAMP or two wall lamps to make a desk an efficient work spot. Place the table lamp on the left unless you write left-handed. Pin-up wall lamps over desk should be spaced 30″ apart. For a desk more than 2′ deep front to back, mount wall lamps on spacer blocks to bring bulbs out to 17″ from front desk edge. They should have 6″ diffusing bowls and 100-watt bulbs; shades should be neither dark nor very translucent.

BRIDGE LAMP can be updated without tools. Turn socket straight up. For indirect bulb, get wide harp that screws onto socket shell. For frosted bulb, screw on a plastic diffuser. Have shade edge 48″ above floor.

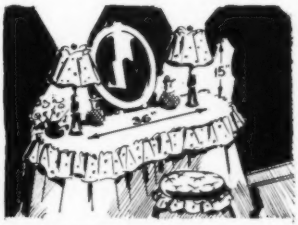


For Bedtime Reading

THREE-LIGHT BULBS give you a choice of 50, 100 or 150 watts at the snap of a switch. A special socket with a four-way switch is needed, but it's even easier to install than an ordinary one. Twist socket counterclockwise before threading it on, to avoid winding up the cord.

FIND THE MURDERER or do other pre-slumber reading in comfort. Light up the pages with either a table lamp located as above, or a wall lamp centered over the bed (right). Use a frosted bulb if the lamp has a diffusing bowl, a mushroom-shaped indirect bulb if it has a bare socket.

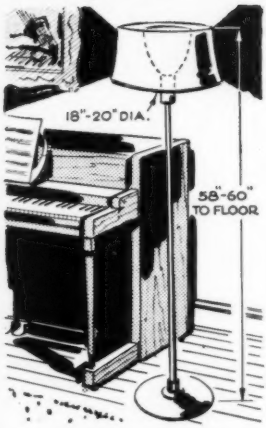
For Make-Up Light at a Dresser or Vanity Table



BALANCED LIGHT is what women want for make-up and hairdo. This calls for two lamps. Use tall ones for a dresser as at right, low ones for a vanity as above. Shades should be at least 9″ in diameter at the bottom and white or nearly so. Colored shades may alter skin tones.

Please turn the page for more lamp ideas.

For the Piano

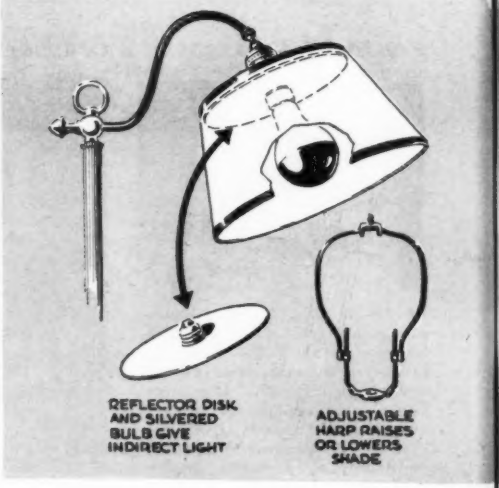


LIGHT THE MUSIC to make playing more fun, practice more effective. Use torcheres as at left, if you have them. Or spot a big floor lamp as above. A swing-arm lamp can be used, too. The arm overhang will let you set it closer—22" to right or left of keyboard center. See drawing at right for remodeling floor lamps.

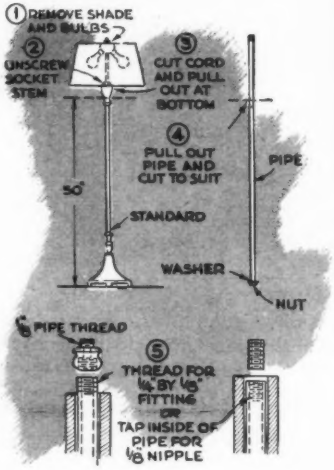
For the Sewing Chair

MAKE SEEING EASIER for sewing, darning, and similar close work by having plenty of light. A swing-arm lamp with a fluorescent tube in addition to a 150-watt bulb is GE's recipe. The arm makes it easy to spot light exactly where it's most needed.

These Gadgets Tailor



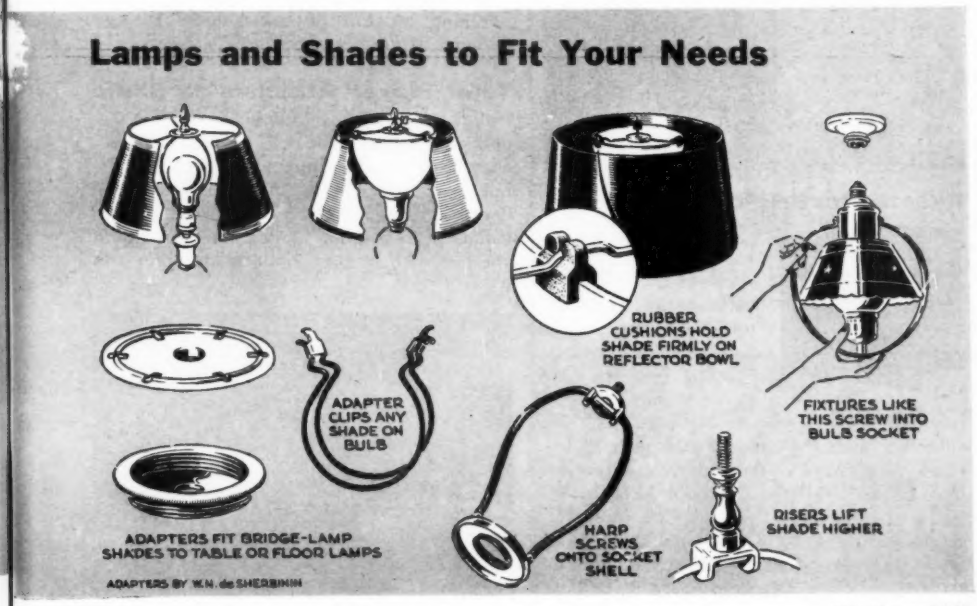
For the Sofa

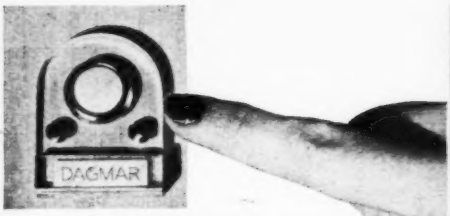


REBUILD FLOOR LAMPS like this to provide right pipe thread (it's called ⅛" but actually measures ⅜") needed to mount upturned socket or three-light unit shown on page 181. For a big 100-200-300-watt three-light bulb, you need a mogul socket and a "husk" in which it fits.

RECIPE FOR READING on the sofa calls for a good-sized floor lamp with a generously large shade. Spot it alongside the reader as above. General Electric recommends a mogul three-light bulb, or a 150-watt bulb. This may be indirect (mushroom-shaped) type, or an ordinary frosted one in a diffuser or reflector. Lamp arrangements suggested for reading in chairs may be used here, too.

Lamps and Shades to Fit Your Needs





EMBEDDED IN PLASTIC, name strip is sealed against weather. Plate above also holds bell. Simpler one at right is mounted beneath existing bell.

Plastic Sandwich Makes Name Plate for Door

CUT your name out of a calling card or stationery, sandwich it between two pieces of clear plastic—and you have an attractive name plate for your door.

Making either of the two styles shown above requires no special equipment. Use acrylic plastic, cutting the pieces slightly larger than the printed paper strip. Thoroughly wet the meeting plastic surfaces with solvent until they are softened sufficiently to take up the thickness of the card. Set the name in position on the base, add the cover piece and clamp the assembly in a padded vise to squeeze out bubbles. When the joint is dry, sand the unit smooth and buff to a high polish.

"Chicketeria" Made from Barrel

A WOODEN barrel and scraps of lumber were used by Chester Young of Arlington, Vt., to make this automatic chicken feeder (left). He removed both ends of the barrel and placed it in a wooden bin 6″ high. Four 2″ strips hold the barrel off the bottom of the bin, permitting the feed to sift down. The hanging lid discourages chickens from perching on top of the feeder.—*Eleanor Gilman, Middletown Springs, Vt.*

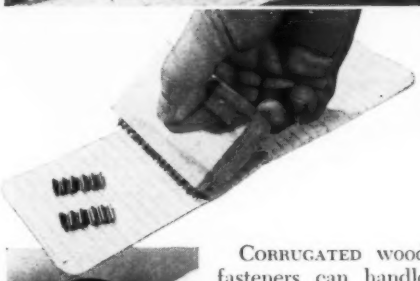
Reactivator Brightens TV Screen

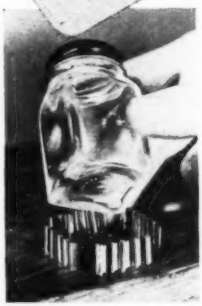
A WORN-OUT picture tube may get a new lease on life from this cathode-ray "reactivator." Gases released by tube elements tend to "poison" the cathode's barium surface and reduce its ability to emit electrons. The reactivator heats the cathode and partially restores the barium surface, increasing picture brightness. The tube does not have to be removed from the set. The device, made for servicemen's use by Transvision, Inc., New Rochelle, N.Y., does not repair broken or shorted components in the tube.

Tape Player Attaches to Radio

THE playback machine below is the magnetic-tape equivalent of a phonograph record player. It plays from a pre-recorded tape but does not record sound. The Pentron Corp., Chicago, makes one model for attachment to a radio, TV or phonograph, and another with its own built-in amplifier and speaker.

Wood Fasteners Do Other Jobs



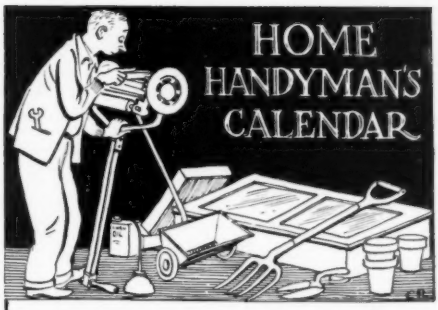


CORRUGATED wood fasteners can handle many extra duties in your home and shop. Steel rules and straightedges, which are awkward to pick up from a flat surface, can be racked neatly on edge between fasteners partly driven into a shelf (top). Mounted end to end they make a simple "dotted-line" tool for perforating paper (center). Make a saw cut in a block of wood and force in the fasteners.

Small glass jars that might accidentally be brushed from a shelf can be held in a snug-fitting fence of the fasteners.—*J. J. Rea, Urbana, Ill.*

Nuts Locked by Plugs of Nylon

LOCK washers are eliminated by the nylon insert in one of the hex faces of this nut. The nylon plug is compressed but not cut by the threads, providing a positive locking effect at any point on the bolt—it does not have to be seated. When the nut is removed, the nylon resumes its original shape so the nut can be reused. Townsend Co., New Brighton, Pa., makes it.



February

The year's shortest month can seem the longest when you're waiting for spring. But don't just dream of outdoor days ahead. There's plenty to do inside.

● You can repair and paint outdoor furniture. You can check your garden tools, and resharpen the lawn mower. Hotbeds and cold frames can be readied for early planting. Basement storage rooms can be built against an early harvest of garden vegetables. If you are going to screen in a porch this year, prefabricate the screens now as suggested on p. 208.

● This is also a good month to fight noise on the home front. Check faucets for dripping, or chattering washers. Clean plumbing drains and traps. Stop banging in water pipes by installing water-hammer silencers. This is easier than it seems. First, install a tee in the water line as near as possible to the noisy valve; second, thread a three-foot capped pipe into the tee, straight out if space permits.

● Clear snow off roof and away from cellar windows and sills as soon as possible because alternate thawing and freezing may cause leakage.

Look What They Did with a Bottle

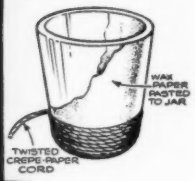
Empty bottles are full of ideas for imaginative hobbyists. Here are a few.

A JUGFUL OF MOONSHINERS (left) is the work of James G. Klein of Chicago. He carved the cabin and figures from balsa and basswood, took them apart, then pegged and glued each piece in place inside the bottle.

BOTTLE CARICATURE is a specialty of Mrs. Berta Simpson, Oakland, Calif., who has made and sold dozens—all different. She uses self-hardening clay, paints in colorful details.

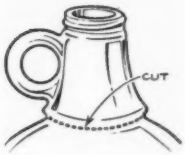
VASE LOOKS LIKE POTTERY, but was made without a wheel. Ruth Perlmutter, Freeport, N. Y., coated bottle base with Foolstone molding powder.

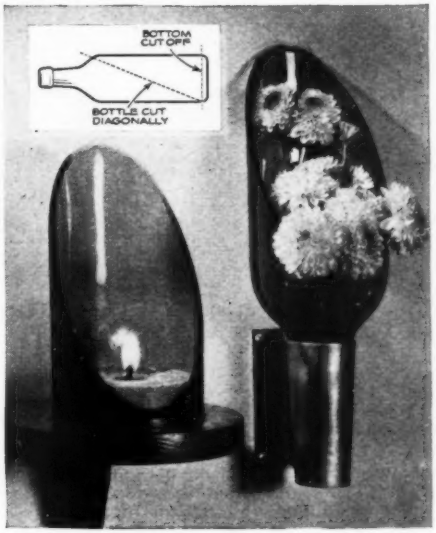
YOU can get more out of a bottle than what comes inside. When it's empty it really gets interesting. Typical of the many useful, decorative items craftsmen create from the jugs, jars and bottles that most of us throw away are the examples on these pages. They are a few of the hundreds submitted in a recent contest sponsored by the Glass Bottle Blowers Association.



TWISTED CREPE PAPER wrapped around jar forms base of lamp above. Jelly glass (left), covered same way, becomes attractive container. Mrs. A. Dellget, Wheeling, W. Va., pasted wax paper around glass, coiled crepe from bottom up, shellacked it.

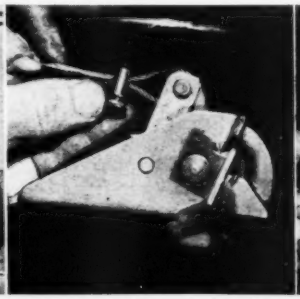
OLD FORMS LOOK NEW when bottles are cut apart. Andrew M. Harvey, Waterville, Ohio, found attractive shapes that everyone has seen but few have noticed. Candle holder (left) is a cutoff jug neck. Ash tray with knock-out knob is bottom of wine bottle, complete with dimple. Another wine bottle, cut diagonally, produced both candle sconce and wall planter at right.





Pop-Up Trunks Are Here at Last

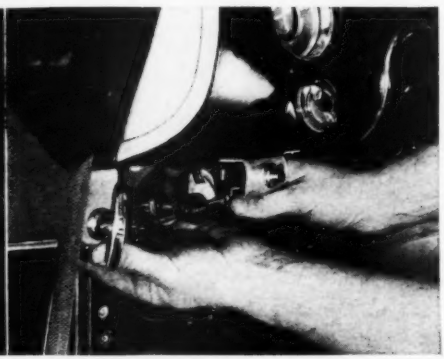
TO INSTALL OPENER, either electric or direct-pull type, first remove the deck latch as above so release cable can be attached.



LOOP CABLE around pivot pin of the latch mechanism. Leave clamp slightly loose to permit adjustment of the cable length later.

SOLENOID opens latch in an electric system. Mount it under deck with sheet-metal screws. Then adjust cable length and tighten it.

TEST OPERATION before closing trunk lid. A temporary setup is being used here. After opener is working smoothly, tape a wire from solenoid along car frame to instrument panel.



MOUNT SWITCH on dash, picking up a hot wire connection at any convenient spot. The switch bracket shown was made from a scrap of polished-aluminum stair-tread nosing.

Sit in your car, press a switch or pull a knob, and deck lid flies open. No need for the extra lock and key.

By E. F. Lindsley

FOR years, many car hoods have unlocked from the driver's seat. Now you can apply a similar rig to the luggage compartment. With a home-installed electric opener, you simply touch a dashboard button. A solenoid under the deck lid then yanks a cable, the cable unhooks the latch and the spring-actuated lid pops up. (For a plush sports car with a similar gadget, see p. 99.)

Supplied as a kit for about $10, this accessory is easy to install and works well. If you fret about the possibility that a run-down battery might keep the lid locked, you can use a manual pull cable, terminating in a handle located somewhere on the parcel deck behind the rear seat. This works well on a coupe, but is inconvenient on other body types.

Whatever you do, be sure the system is operating perfectly before you close the lid. Accidental closing means a ticklish job of releasing the latch mechanism by poking through the handle bolt hole—or removing the rear seat.

Getting rid of the trunk handle allows you to smooth off the deck—a popular customizing job these days. For a quick and easy job, you can plug the bolt holes with jeweled reflectors. But filling in with solder and repainting the area gives a neater result. END

DIRECT CABLE PULL can also be installed. With one end attached to latch, run the cable through any convenient openings to a small hole punched in fiberboard parcel deck.

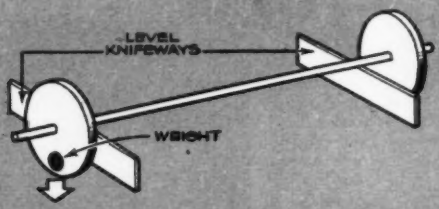
ANY PULL HANDLE will do for cable terminal behind seat. Here a door knob was attached to cable with a setscrew. Reliability and minimum expense are advantages of this outfit.

FOR CUSTOM LOOK, trunk handle can be removed and deck smoothed off (left). The holes were filled with disks of brass shim stock soldered into place. Solder was then ground flush with deck surface and minor imperfections filled with body putty, scraped on with a sheet of cardboard.

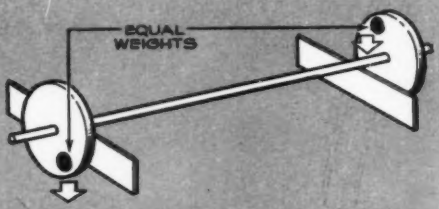
RUBBING OUT with compound was final step (right) after matching lacquer had been sprayed on. Before this, the body putty had been wet-sanded, the surface cleaned, sprayed with primer surfacer, and the primer wet-sanded and then feathered out into original finish.

Specialist Balances Engines for Peak Speeds

BALANCED AND BEAUTIFUL. These are the parts that need dynamic balancing. Con rods and pistons are matched to lightest in set. Crankshaft is balanced by drilling counterweights.



HERE IS *STATIC* UNBALANCE. Roll this shaft on knifeways (which reduce friction) and it always will come to rest with weight down because gravity carries it to lowest possible point. But add equal weight to second disk at 180° to position of first, and you get . . .



. . . ***STATIC* BALANCE.** Rolled on knifeways, shaft now stops with weights in any position, for pull of gravity on one exactly equals that on other. But in a car engine, this is not enough, for "static" means standing balance. Revolve shaft fast and . . .

Removing throb from a spinning crankshaft takes a nice touch. Here's how Bob Osiecki does it.

By Howard G. McEntee

EVERY large service garage has its specialists. But in Lyndhurst, N.J., you'll find an entire garage devoted to just one specialty—and a rare one at that.

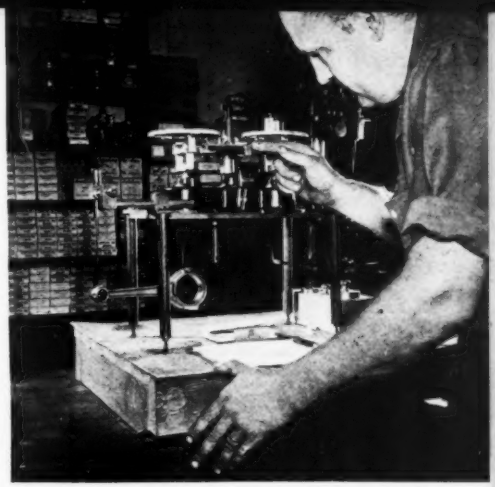
The specialist is Bob Osiecki. His work is dynamic balancing of auto engines. His clients are mostly racing drivers and speed or high-performance enthusiasts. But he also does occasional jobs for owners of average family cars.

What Osiecki does looks simple. Just drilling holes in the counterweights of crankshafts and filing metal off con rods and pistons. But where to drill and how much to file? That's the trick.

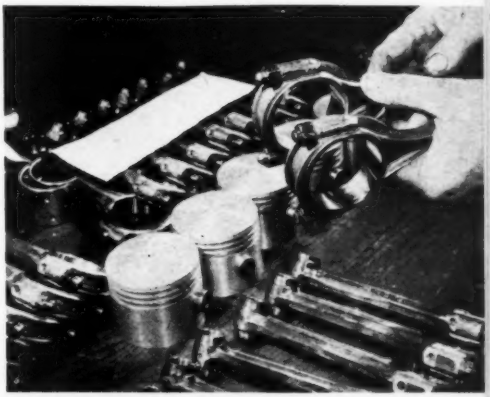
In all the United States, there are only a few mechanics qualified and equipped for dynamic balancing. Osiecki is one of the best known in the East.

What it does. Dynamic balancing saves oil. It prevents bearing wear. It gives smoother engine operation at all speeds. It increases top r.p.m. 10 percent or more, carrying horsepower up a bit, too. The latter point naturally appeals strongly to all racing drivers and high-performance enthusiasts. But none of these advantages is the major one that first brought dynamic balancing into being—on the race tracks.

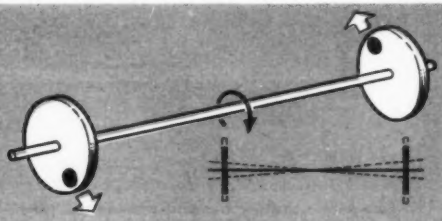
On the tracks, an engine must turn over far faster than on the highways. Stock engines were not designed for such speeds. Every manufacturer makes a definite effort to get engine balance within factory toler-



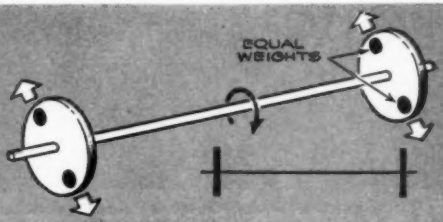
1 BALANCING JOB starts as Bob Osiecki weighs each end of each con rod. Not only must rods weigh the same, but each must have same balance point if rested on knife edge.



2 RODS ARE GROUND as required to match lightest one in set. Notice where metal was removed at right of nut on rod held in left hand above. Matched sets are on bench.



. . . ***DYNAMIC* UNBALANCE** shows up. Centrifugal force, which you feel in whirling a weight on a string, makes revolving weights try to fly outward. If free, shaft would wobble (dotted lines) as its ends moved in a circular path. To fix this, shaft needs . . .



. . . ***DYNAMIC* BALANCE.** It is achieved in this example by adding weights to counteract the original one-sided centrifugal force—and the shaft runs true. In actual engine balancing, weight is removed from heavy side of shaft by drilling or filing away metal.

3 METAL IS CUT from inner surface of a piston skirt with piston chucked in lathe. Like the con rods, pistons are matched to the lightweight of the set. Long practice enables Osiecki to lighten a set of pistons with minimum cutting and weighing.

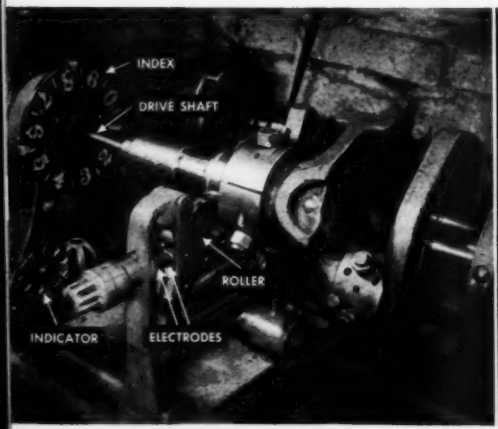
4 MATCHED PISTONS. On very heavy ones, wrist-pin bosses are shaved to cut over-all weight. In weighing rods and pistons, a very accurate balance is used. It weighs to .1 gram (1/300 ounce). Piston rings aren't touched—they usually match when new.

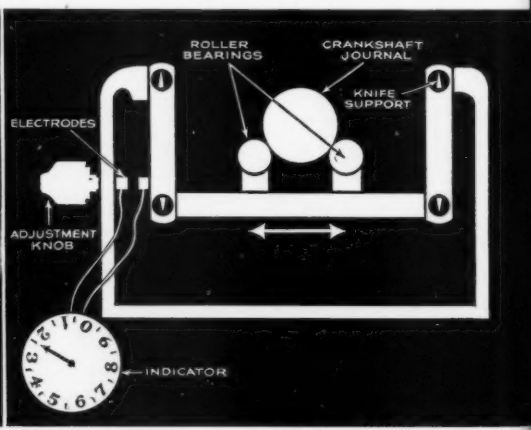
ances. But where the factory leaves off is just where balancing experts such as Bob Osiecki begin.

Without dynamic balancing, a racing engine could never safely rev up to 6,000 r.p.m. or better. If you know anything about the science of dynamics, you know that even a fraction of an ounce, slightly misplaced, multiplies enormously when a mass revolves at such speeds. Unless the engine is in pretty good balance, it may quickly throw a piston or con rod.

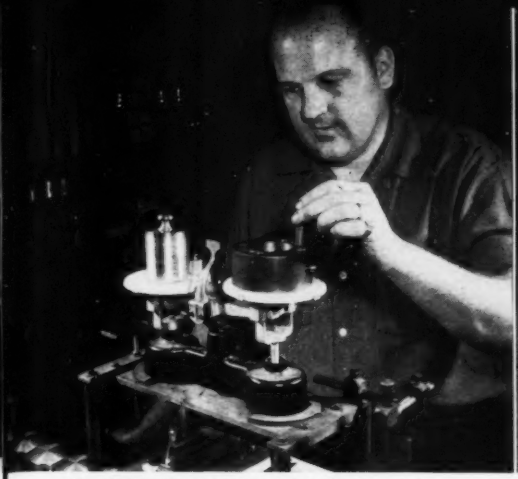
How it works. If you ever have run a pulley at high speeds, you know it must be centered exactly, that one side must not be heavier than the other. An off-center pulley could shake itself to pieces if revolved fast enough.

An engine crankshaft is, in effect, a series of pulleys in line on the same shaft,

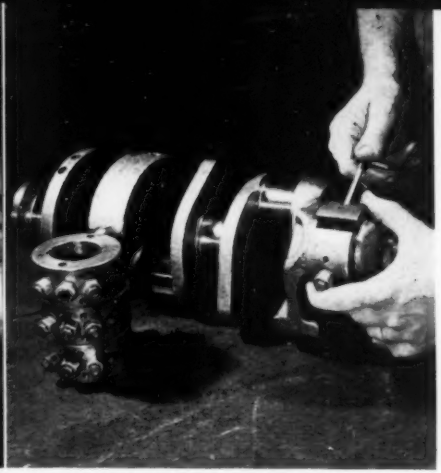




7 HEAVY SPOTS ARE FOUND by rotating shaft in freely suspended cradle. Cradle swings back and forth as heaviest point on shaft, turned by electric motor, passes each side. As cradle swings, it makes contact with electrodes at each end, firing numbered spark-gap indicator (small dial). Rotary contacts arranged as in auto distributor cause spark to jump at number on dial that corresponds to heavy point on shaft. Operator then sets index dial (large one on shaft) to corresponding number. This locates heavy point *around* shaft. To locate point *along* shaft, operator moves first one electrode, then the other, closer to cradle. End that sparks first is wobbling most and thus is heavier.

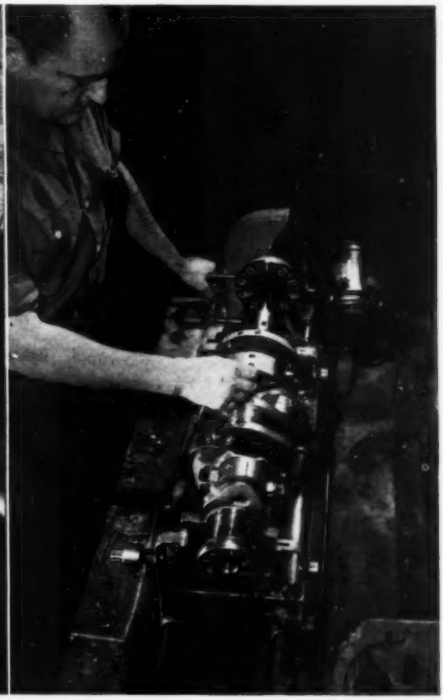


5 HERE'S THE SECRET of job. Bob weights must be placed on crank throws before a shaft can be balanced. To find how heavy to make them for a V-type engine, the weights of the con rods, pistons with pins, pin locks and rings are entered in a special formula.

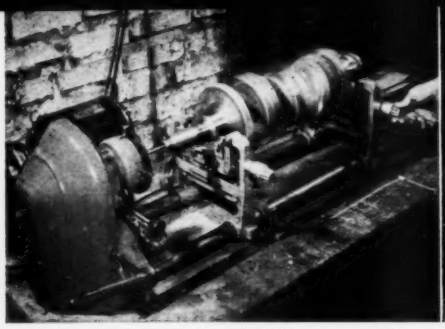


6 MATCHED BOBS, brought to weight indicated by formula, are clamped on the throws. The formula? Osiecki isn't talking. He developed it the hard way. It is required in balancing a V engine because the rods and pistons affect balance of shaft from two planes.

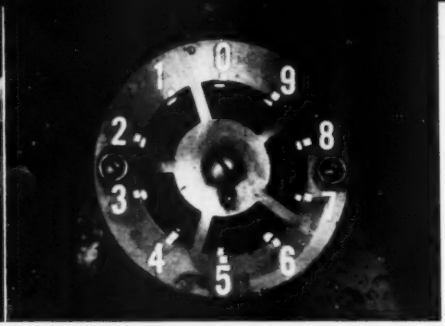
8 HOLES ARE DRILLED to remove weight at heavy spots located on cradle. But easy does it! Holes are not drilled full depth first time. Removing too much weight would throw off balance in other direction. A double-thickness counterweight like second from right is drilled as two separate units, since that's how it functions when it revolves.



9 BACK AGAIN for another test on balancing machine, shown in full here. In early stages, shaft is revolved only in spurts. If badly unbalanced, a shaft spun at high speed would jump out of cradle. Electrode knobs are gradually moved closer as shaft nears balance point and swings less. For stability, balancer rests on 3,000-pound concrete block.



10 BALANCING BEGINS at 200 r.p.m. When speed can be raised to 2,500 r.p.m. without a tremor, as above, Osiecki considers shaft okay for engine use at 6,000 r.p.m.



11 PERFECT BALANCE—and indicator shows it. Sparks at each number mean electrodes have been turned up to make continuous contact and shaft isn't swinging at all.

one at each throw. When the shaft revolves, the counterweights, connecting rods, and pistons all have their say as to whether the shaft will run smooth and true. If the shaft tries to wobble, if the spinning mass isn't centered right, trouble develops. Periodic vibrations shake the whole car. Power is wasted because bearing loads go way up. When bearings wear, oil consumption jumps.

Specialist's job. Equipment required for dynamic balancing is not particularly complex. In fact, some of it is homemade. But you have to know how to use it.

Osiecki makes it clear that balancing the crankshaft alone is hardly worth the trouble. Real results aren't achieved until all the moving parts—including pistons, rods, flywheel and clutch plate—are included.

The cost? If Osiecki does all the tearing down and reassembly work, the average balance job runs around $125. If you show up with a box of engine parts, balancing alone costs about $40.

For racing drivers and hot rodders, the value of this work has long been proved. How about the average family sedan?

Well, if your driving mostly involves short-haul, modest-speed trips, you can forget about dynamic balancing. It probably wouldn't pay out. But if your gearshift lever vibrates at 29 m.p.h., the front fenders start to flap at 43 and the car shakes as though it were about to take off at 56—brother, you could use some dynamic balancing! END

Next Month: If you have a two-door sedan, you have a traveling bedroom. POPULAR SCIENCE shows you the three conversion steps.

ELECTRICAL TERMS

Ampere. This designates the *amount* of current flowing through a wire at any given instant. Ampere ratings on fuses, switches, outlets and wires mean they are able to handle the stated amount of electricity safely.

Volt. This is the unit of electric *pressure* that forces current to flow through the wires. No current (amperes) can flow without this pressure (volts). Fuses, switches, outlets, and wires are rated in volts as well as amperes. An electrical appliance also has a voltage rating, indicating that it is safe to use at that pressure.

Watt. This is the unit of electric *power*. You determine it by multiplying volts by amperes. For instance, an appliance drawing 5 amperes at 120 volts will use 600 watts. Most appliances show the watts they use.

Watt-Hour. This is the unit of electrical *work*. It is the unit of electric power (watt) multiplied by the time (hour). Since the watt-hour is too small a unit for most practical purposes, work done by electricity is usually measured in units of 1,000 watt-hours—kilowatt-hours.

Voltage Drop. This means a drop in electric pressure. It occurs when too many appliances or lights are connected to the electric system. It makes appliances inefficient and slow in their operation.

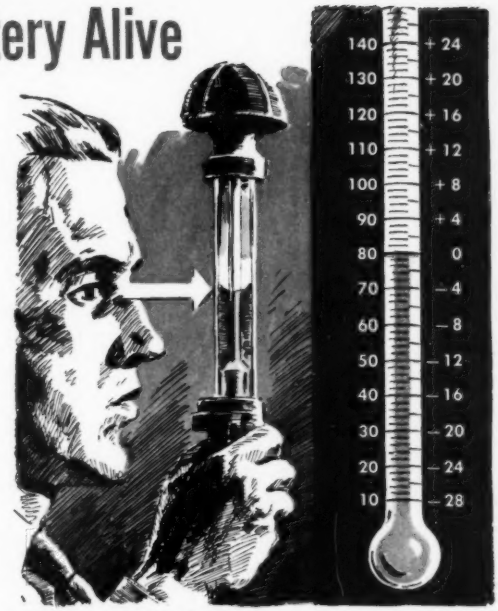
FOR YOUR POPULAR SCIENCE INFORMATION FILE

Keeping Your Battery Alive

BATTERIES FREEZE if undercharged during severe winter weather. At a specific-gravity reading of 1.150, a battery would freeze at 5° F. At 1.250, it would be safe to minus 62° F. After adding battery water in cold weather, be sure to run the engine to mix the water and electrolyte.

ADD DISTILLED WATER as required to keep electrolyte level above plates and separators. Check this at least every two weeks. Correct level varies with battery type. Know yours.

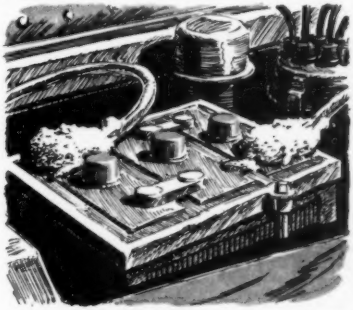
HYDROGEN GAS is a by-product of battery charging. Because this is highly explosive, all flames should be kept away from a battery on the charging rack, especially when it's open. A static spark can also explode this gas.



TO READ A HYDROMETER, hold it straight and keep your eye level with surface of liquid. Ignore liquid curvature at edges. Hydrometer gives direct reading only at 80° F. Chart shows specific gravity points (right column) you should add to or subtract from reading at other temperatures (left column). If corrected specific gravity is less than 1.250 in any cell, charge battery. When taking readings, do not transfer electrolyte from one cell to another.

IN BUYING A BATTERY, pick one with an ampere-hour capacity at least equal to the original. Get one of greater capacity if you have installed additional electrical equipment. In most cars, standard battery has only enough capacity for original equipment.

EXCESSIVE WATER LOSS from all cells indicates overcharging. This reduces battery life and can damage lights, ignition contacts and other electrical parts. If overcharging occurs, generator regulator probably needs attention.



CORRODED TERMINALS may cut down generator input or weaken starter performance. Brush clean, wash in baking-soda solution, coat lightly with petroleum jelly.

When he pulled up in front of the Model Garage, the radiator of the brand-new car was boiling. "Temperamental youngster," Gus muttered to himself.

Gus Helps Tie a Knot

It looked as if the happy couple would have to spend their honeymoon in a roadside garage—unless Gus came to the rescue.

By Martin Bunn

IT WAS a sleety evening and Gus Wilson, his chin tucked well down into the upturned collar of his overcoat, was trudging toward Dan's Grill for some dinner. It had been one of those days at the Model Garage and he was glad it was over. He was looking forward to a sizzling steak with French fries and later an evening at home with a magazine.

Just then a pert voice interrupted his thoughts. "Hello, Mr. Wilson."

Gus looked down to find a very attractive young lady walking beside him. After a second look, he realized it was Peggy Anne Simpson, daughter of the vice-president of the local bank.

"Why, Peggy Simpson," said Gus, taking her arm to help her buck the cold wind. "What on earth are you doing out on a night like this? Thought you were getting married tomorrow afternoon."

Wedding Prospects Look Dim

Peggy laughed a nervous little laugh. "I *hope* I'm getting married tomorrow."

"What do you mean, hope?"

"Tom—that's my fiancé, Tom Thornton—hasn't gotten here yet, darn it," explained Peggy, clamping her hat down more firmly on her pretty blond head. "He's driving up from Stanton—that's his home. I expected him early today, but he called tonight to say he's having trouble with the new car he bought me for a wedding present. He's stranded about halfway here."

"Trouble with a new car? What kind of trouble?"

"If I didn't love that man I'd be inclined to doubt his story. Here we're shivering with the cold and he claims our brand-new car is overheating."

By this time Gus and Peggy had reached the neon-lit door to Dan's place. "Join me?" asked Gus.

"I'd love to, Mr. Wilson, but I've got some last-minute arrangements to make for tomorrow—if Tom ever gets here. Gosh, I just happened to think, I guess our honeymoon will have to be postponed too. We'd planned a trip in the car."

"Well," Gus said sympathetically, "if I can be of any help, don't forget to call on me."

Gus Meets Tom Thornton

At about 2:15 the next afternoon a very tired- and worried-looking young man drove his car onto the concrete apron in front of the Model Garage. Gus had seen the car pull up and had the repair-shop door open.

"Mr. Wilson?" the driver inquired tensely as he slid out from under the wheel.

"That's right—and I'll guess you're Tom Thornton."

The young man managed a weak smile. "And how did you know that?"

"Saw that beautiful bride-to-be of yours last night, and she told me about your car trouble. She was pretty upset when you didn't get here yesterday."

"*She* was upset!" Tom ran his fingers through his hair and his voice sank dramatically. "To tell you the truth, Mr. Wilson, I had my doubts more than once about getting here at all in time for the wedding."

"When did your troubles start?" Gus inquired gently as he ushered Tom into the shop.

"Almost as soon as I left home. I hadn't gone more than 30 miles when I noticed

that the temperature gauge was up above normal. Naturally, I stopped to check the water. But the level was okay."

Gus nodded as he prodded some shreds of tobacco into the bowl of his pipe.

"When I got to the next town, I stopped at the first decent-looking garage I could find. The mechanic made some checks. Said the gauge was out of whack and that I shouldn't worry about it. I took his word for it and drove on. Oh brother, then my troubles really began."

Tom Tells His Tale of Woe

Young Thornton's story of what happened during the next several hours even made Gus, with all his experience, wince.

After the first garage stop, Tom, believing what the mechanic had told him, rolled along. He ignored the temperature gauge. Then suddenly he heard a boiling noise in his heater. He stopped and this time found the radiator almost bone-dry. Miles from nowhere with no water in sight, he stuffed handful after handful of snow into the filler spout.

For the next 50 miles, the temperature gauge registered "normal" again. But after an overnight stop at a motel, the needle began climbing again in the morning.

He pulled into another roadside garage. This time the mechanic flushed the radiator and checked the entire cooling system. He found nothing, but said that "just to be on the safe side" he would remove the thermostats.

Tom had left that garage with a glimmer of hope that maybe his troubles were over. Even though he nearly froze because the heater wouldn't perk without the thermostats, he was happy to see that the temperature gauge stayed well below normal.

His peace of mind, however, did not last long. Soon the gauge began climbing again. Another stop at a garage proved nothing. But when he got on his way again the gauge stayed down on the cold side.

Three Hours to Shoot the Trouble

"How's it acting now?" asked Gus at the end of this grim tale.

"Right now, she's fine," Tom admitted, "but she blows hot and cold and I'd hate to start off on a honeymoon and spend the night in a roadside garage."

Gus grinned. "What time is the wedding?"

"Four-thirty, with a party afterward at Peg's house before we take off. We'd hoped to get away around six. I've got a hotel reservation down in the city for tonight."

Gus looked up at the small electric clock over his bench. It was just 2:45. He had only a little over three hours to find and fix the trouble if the newlywed Thorntons were to start their honeymoon on schedule.

"Tell you what you do," said Gus, patting Tom's shoulder paternally. "You take my car for now—it's parked outside—and I'll see what I can do about yours. Now, don't worry—I'll try to have your car outside Peg's house by six o'clock."

Tom's expression brightened perceptibly. "If you do," he said, pumping Gus's hand vigorously, "you're my friend for life."

Not a Ghost of a Clue

After Tom had gone, Gus wondered if he hadn't left himself out on a limb. His sympathy for the distraught young man must have affected his judgment. Of course, old cars that overheated in summer were run of the mill—a good flushing generally cured them—but a brand-new car that ran both hot and cold in the wintertime was something else again.

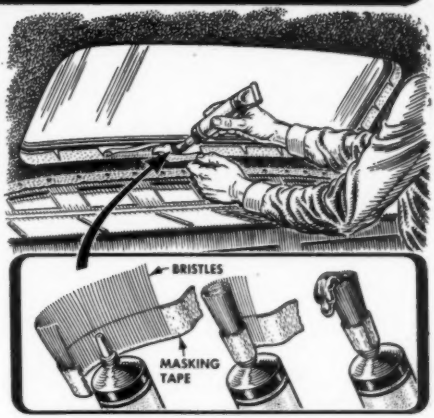
Gus got to work. He started by going over the radiator core carefully. Nothing there. He checked the radiator hoses, thinking that perhaps in some way the inner lining of one of the two sets—it was a V-8—might have come loose, forming a flap valve that cut off the circulation of water at certain speeds. Still no luck.

He started the engine and peered down the filler spout. Water circulation looked to be normal.

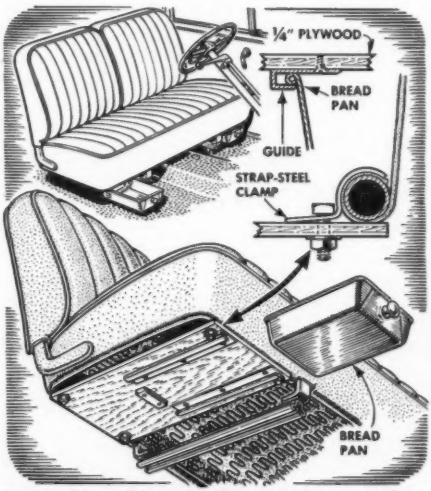
[*Continued on page 252*]

Hints from the Model Garage

Hook Locks Jack Handle. On the usual scissors jack, the handle cross pin has an annoying habit of slipping out. A hook like this will lock the handle in place. Tighten the screw so friction keeps the hook closed while the handle turns.



Tube Brush Spreads Cement. In applying head linings, G. E. Gannaway, Chattanooga, puts cement on with an attached brush made from paintbrush bristles. A nail inserted into the tube keeps the cement from drying out while stored.

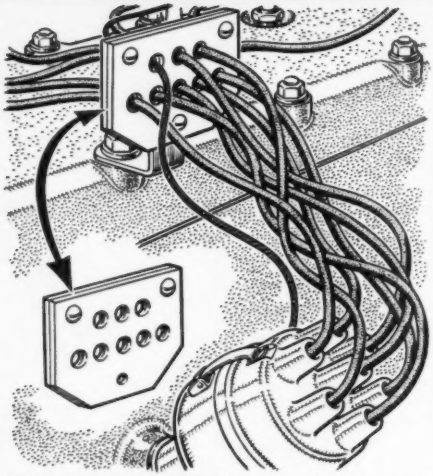


Pans Give Storage Space. To provide a place for small tools, Gladden Houck Jr., Port Chester, N. Y., installed bread pans under the seat of his Henry J. Pans 2¾" by 5¾" by 9¾" fit nicely. The pan edges slide in guides made from J-shaped tileboard molding, widened a bit by driving in drill rod.

Bracket Holds Extinguisher. A can-type fire extinguisher mounted behind the dash like this can be pulled out in a hurry. The bracket is formed from two storm-sash eyes. Put them in a vise and bend as shown, making a hook on the end of one. A heavy rubber band will then keep the extinguisher in position.

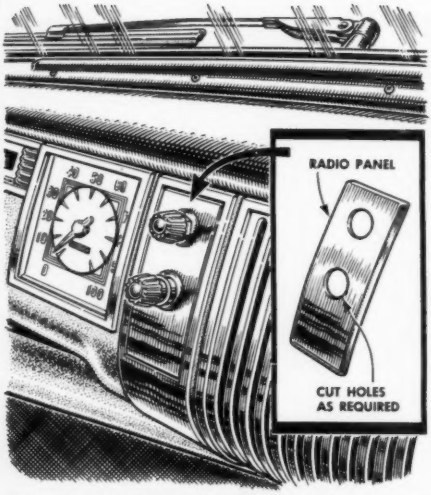
Please turn the page for four more hints.

MORE Hints from the Model Garage

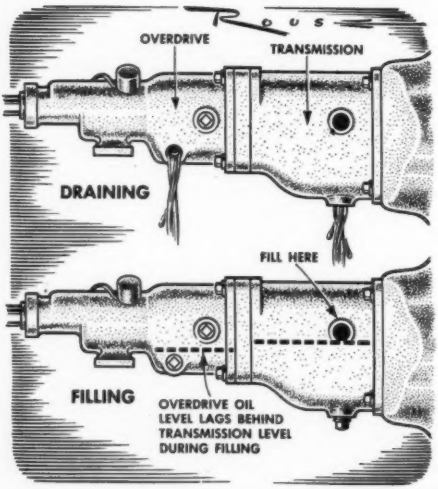


Tile Prevents Shorts. An ignition-wire support can be made from two layers of compressed floor tile. Since the tile is an insulator, this is less likely than a metal bracket to cause shorts if insulation wears.

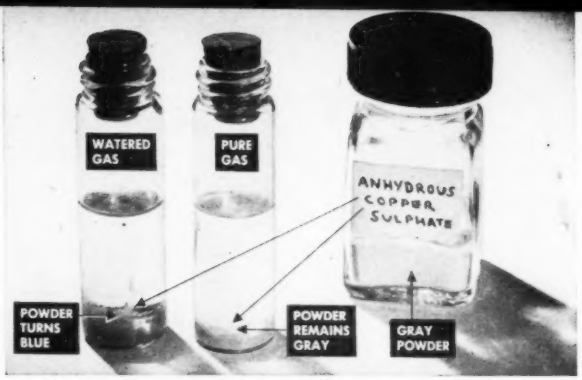
Cords Control Garage Light. In an attached garage that has a light switch only at the house entrance, a cord arranged like this will enable you to turn the light on or off from the garage door.

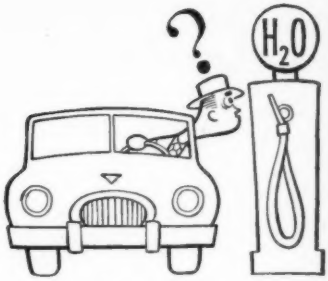


Put Radio Panel to Work. If your car has no radio, you can use the blank panel as a mounting place for accessory switches that you add to the car. Remove the panel and drill or cut out necessary holes. Carefully done, this will look better than switches simply clamped under the dash.



Fill Overdrive Slowly. In some overdrive units, the fill plug is lower than the transmission fill plug. Hence, to get enough lubricant into both units the lubricant should be pumped into the transmission and allowed to flow into the overdrive. Do this slowly so the overdrive has time to fill up.





Does Your Gas Contain Water?

A PALE gray powder, anhydrous copper sulfate, will tell you whether there is water in the gasoline you buy.

To make this sensitive test, get blue copper sulfate crystals at a drugstore, put an ounce in a glass baking dish in an oven heated to 490° F., and leave until it turns a pale gray color, indicating that all water is removed. Bottle the powder when cool.

To test gasoline, add a little to some powder in a vial, stopper the vial and shake. If the gas contains water the powder will take back what it lost and turn blue. If there is no water the powder will remain gray.—*Ken Swezey, Brooklyn.*

Silicones Protect Battery

MOISTURE, dirt and sulfuric-acid film will gradually discharge a battery. You can protect your battery by first cleaning the top with household ammonia, scrubbing it well with a stiff brush. When the top surface dries, apply as shown at right a film of the silicone paste that is sold for waterproofing insulator surfaces. If you can't get this paste, use auto wax that contains silicone. Be sure to wipe off excess wax or it will help dirt accumulate.—*Harry L. Truchelut, Atlanta.*

Toe Switch Holds Throttle

IF YOUR foot gets tired holding down the accelerator on a long trip, this "speed selector" will do it for you.

When you reach the speed you want, press the button and the accelerator locks at that position. When you again touch the button—or the brake pedal—the throttle is automatically released. D. & M. Mfg. Corp., Anderson, Ind., makes the device.

Wreck Produces a Custom Car

AFTER a collision bashed in the front end of his 1942 Packard convertible, R. M. Smith of Salem, Ore., set to work and turned out the custom job below.

He removed the three grille panels, welded sheet metal over a frame to blank out the top two-thirds of the center grille, installed this unit and leaded the joints to conform to the body lines. Three horizontal bars were rolled from heavy sheet, chromed, and mounted in existing holes. Three small vertical bars at each end are shortened Buick grille bars. Bumper brackets were re-formed to accept an Olds bumper and altered gravel pans. An air scoop underneath takes care of cooling.

How to Fix Car Locks

A headache when they don't work, locks respond to these repairs.

By Jack B. Harrison

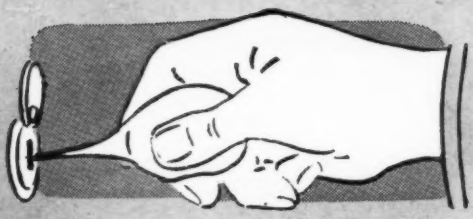
KNOWING a few facts about car locks can save you a lot of time and trouble—to say nothing of expense. Give them the care they need and you can avoid most common lock troubles.

Locks used often and kept clean and lubricated will seldom stick, fail or freeze. It is the infrequently used lock that is most likely to let you down. It will accumulate dirt and water—and may jam up just when you need it most.

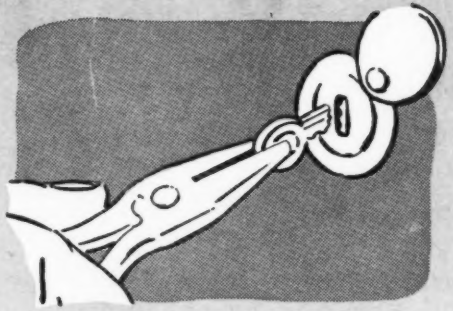
So regular cleaning and lubrication of all locks is your first rule. Use a solvent like benzine, never penetrating oil or any solvent that leaves an oily film. Such a film will gather dust and get you into real trouble. And when it comes to lubrication, microfine graphite is the only thing you can use safely.

When you wash your car in cold weather, seal keyholes with tape. It takes only a drop of water to freeze up a lock. When a lock does freeze, heat the key with a match or cigarette lighter, insert the key in the lock and leave it there a few minutes. Alcohol squirted in with an oilcan or syringe will also thaw a lock. But be careful to keep alcohol off the car paint. After the lock is open, clean and lubricate it. This will help prevent future freeze-ups.

These sketches show you how to clean and lubricate a lock. They also show what to do when strong-arm tactics break off a key. On modern cars, it is generally better to replace an inoperative lock cylinder than to try to repair it. Other sketches show you tricks of the trade in this respect. END

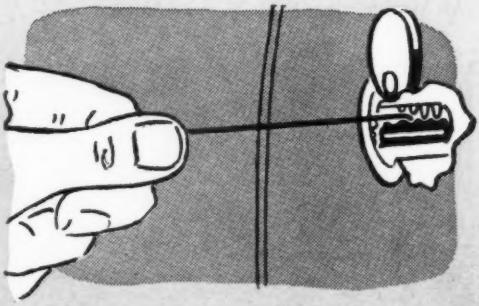


CLEANING a lock is easy. Squirt benzine into the key slot with a syringe or a small oilcan. Work the key in and out of the slot several times to distribute the cleaning fluid. After a few minutes, blow the fluid out of the lock with a syringe or tire pump.

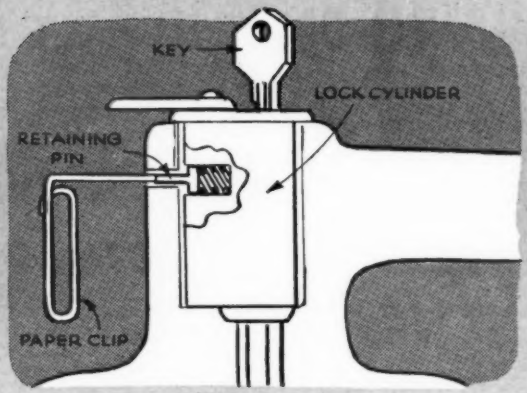


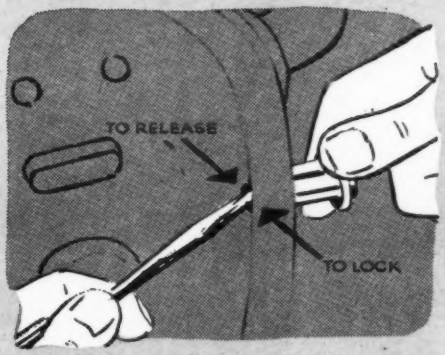
IF KEY BREAKS OFF while you are trying to unlock a door, don't give up. Grasp head of key with pair of pliers, insert it in the slot as far as it will go, and maintain a steady inward pressure while you turn key slowly. Many times this will release the tumblers and the lock will open.

You can make a tool to fish out a broken key. Bend a small finger loop on one end of a 5" piece of hard steel wire. Grind a sharp barb like a fishhook barb on the other end. Push the barbed end into keyhole, as below. Then by fishing and feeling you can sometimes hook barb on broken key and pull it out. Tapping on lock cylinder will often jar tumblers into position so key will come out.

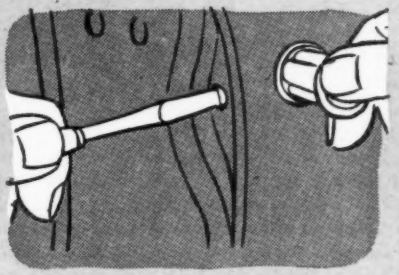


REPLACING PIN-HELD LOCKS. Lock cylinders in door and trunk handles are often held by a small spring-loaded pin. A paper clip and the key are your tools for removing such a cylinder. Put the key in lock, turn it to unlocked position, and turn it back just enough so it won't pull out of lock. Then bend out one end of paper clip (right) and push it into a small hole you'll find near outer edge of handle just below lock cylinder. The clip will release the pin so you can pull cylinder out of handle with the key. To install new cylinder, push it into handle until pin drops into place.

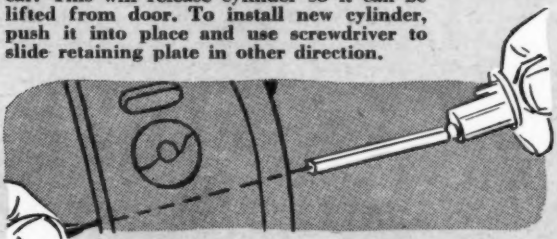




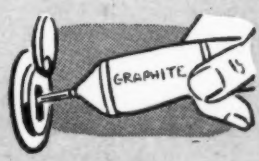
REPLACING SETSCREW TYPE. If lock cylinder is mounted in door panel but you can't find a screwdriver hole in rear of door, cylinder is probably held in place by a hidden setscrew instead of a sliding plate. Carefully pry up the weather strip opposite cylinder. There you will probably find the screw. Cylinder will lift out (below) as soon as you loosen screw.



REPLACING SLIDING-PLATE TYPE. Lock cylinders in door panels may be retained by a hidden, sliding plate. Look for a small hole in the rear face of door opposite lock cylinder. Put a medium screwdriver into this hole and feel for a metal fin or tab. With screwdriver, slide this tab—usually toward rear of car. This will release cylinder so it can be lifted from door. To install new cylinder, push it into place and use screwdriver to slide retaining plate in other direction.



LUBRICATE your locks by shooting in microfine graphite after cleaning them. You can buy graphite in dispensers designed for the job. Work key in and out of lock to distribute the graphite. Wipe excess lubricant from key and lock to avoid soiling clothing.



ALIGNING A NEW CYLINDER. When you install a new cylinder, you may have trouble getting the square cylinder shank into the square hole in the door locking mechanism. If you do, stick a long hat pin through door upholstery so it comes out through cylinder hole in door. Use pin to guide shank into place.

How to Build Double-Deck Bunks

Kids like to sleep in bunks like these. You can easily duplicate this unit for your children's bedroom.

By R. H. Hawkins

DOUBLE-DECK beds mean a double saving —money and space. I built this unit for my two small sons, and it cost me about a third of what stores wanted for a similar one.

Standing in a corner of the boys' room, the beds give an extra 22 square feet of space to play in.

The ladder for the upper bunk is removable for making up the bed, but hooks at the top and rubber bumpers on the legs hold it in place securely. The little steps for the lower bunk aren't really necessary, but they do forestall juvenile struggles about which kid gets "the bed with the ladder."

Since the main ladder resembles the scaling ladders used by firemen, the bunks can be painted a bright fire-engine red. The same decoration theme could be carried out with fire-engine decals on the side or end panels. If your youngsters are up to it, a polished brass pipe could also be rigged up outboard for rapid descents in real fire-house style.

Construction. Since there are no complicated joints, you can build this furniture with ordinary hand tools, using a handsaw and chisel to cut the rabbets in the ladder rails. Parts are held with glue and wood screws. Countersink the screws and fill over the heads with composition wood.

The dimensions given are for the twin-bed coil springs I had. It's a good plan to get the springs and mattresses first and adjust the dimensions if necessary. The height of the guard rail on the upper bed should be set to give maximum protection against accidental tumbles.

Assembly. Begin with the ends. Drill blind holes ½" deep for the 1¼" dowels, and glue the dowels in the holes.

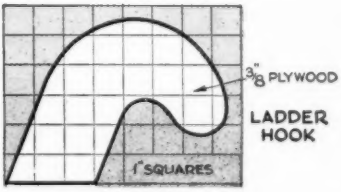
While the ends can be put together in your workshop, the remainder of the job will probably have to be done in the room where the beds are to be used. The completed unit is too large for most doors.

If you want to move the unit later on, saw through the four posts at the points indicated in the drawing. Each bed can then be taken through the doorway by turning it on its side. You can reassemble the beds by boring vertical ⅜" holes in the posts and using ⅜" dowels as locating pins.

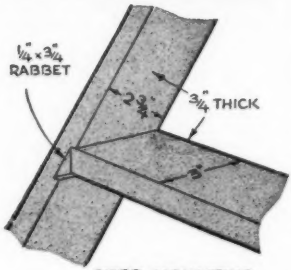
The ¾" by 1" strips on the side boards hold the slats. They are secured with 1¼" screws spaced 8" apart. The plywood panels on one side and one end add a finished look.

I put casters under the posts so the beds can be rolled out from the wall when they are made up. END

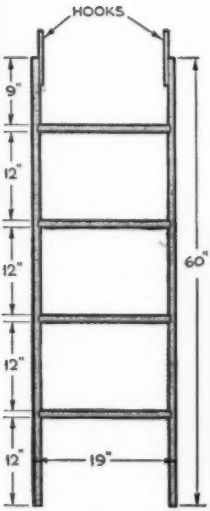
1¼"×41" DOWEL
2"×2"×14"
1¼"×35¾" DOWEL
28"
10"
10"
CAN BE CUT HERE
1"×6"×80"
1"×6"×42"
1¼"×41" DOWEL
2"×4"×66"
1¼"×35¾" DOWEL
10"
2"×2"×14"
31¾"
33¼"
10"
¾"×1"×77"
1"×6"×80
3/8"×11 3/8"×78¾" PLYWOOD
1"×6"×42"
3/8"×11 3/8"×42½" PLYWOOD
PANEL OVERLAPS LEG BY ¾"



LADDER HOOK

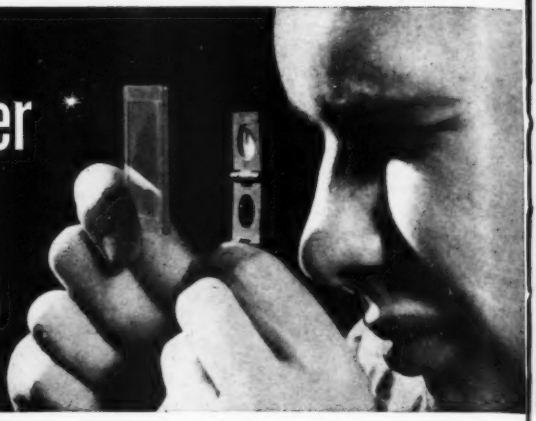


STEP-MOUNTING DETAIL



LADDER DETAILS

Vest-Pocket Viewer Shows Atomic Explosions



A spinthariscope, which is easier to make than pronounce, lets you see bursting atoms in watch-dial paint.

By Kenneth M. Swezey

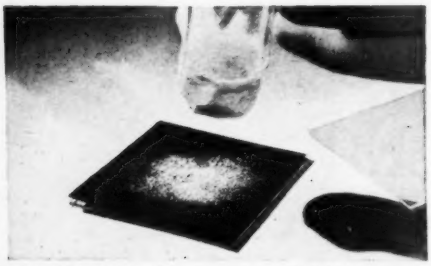
You don't have to wait on a mountain top near Las Vegas to see atoms explode. It takes only a few minutes to assemble a vest-pocket viewer in which you can witness the actual explosions of radioactive atoms.

Make it from radium scraped off a clock dial, a little phosphorescent zinc sulfide, two 2″ by 2″ glass slides and a short-focus magnifier. The photos below show you how. This is a simple version of the spinthariscope, invented in 1903 by Sir William Crookes and still used in atomic research.

Since an infinitesimal amount of radium is used on a clock dial, it is not dangerous

SCRAPE RADIUM PAINT from numbers of a luminous clock dial. A few specks are enough.

MIX PAINT with a gram of phosphorescent zinc sulfide bought from a chemical supplier.



SPRINKLE MIXTURE on square of black paper from a bottle that has cotton gauze stretched over its mouth.

SANDWICH the radium-covered paper between two squares of glass, taping the edges together as you would a lantern slide.

to make this viewer, but you should wash your hands well when you finish.

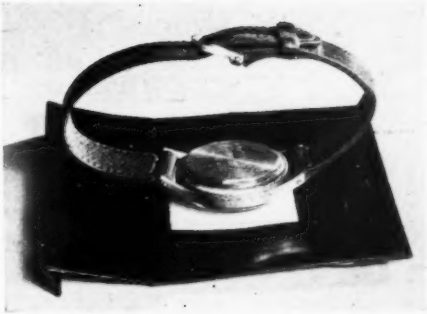
Take the viewer into a totally dark room and wait a few minutes. Then look at the slide through the magnifying glass. You'll see thousands of flashes—like a sky full of twinkling stars. Those are caused by radium atoms in the paint, which are always disintegrating. Each explosion shoots out a 10,000-mile-per-second alpha particle that hits a zinc sulfide molecule to make the flash of light. While not using the viewer, keep it wrapped in black paper.

Another simple trick with the weak radiations from a watch dial shows why workers must be shielded from the immensely stronger radiation in atomic plants.

Put a luminous-dial wrist watch face down over a paper clip resting on a piece of tightly wrapped photographic film. Gamma rays from the watch will shoot right through the light-tight film wrapper but not so easily through the paper clip.

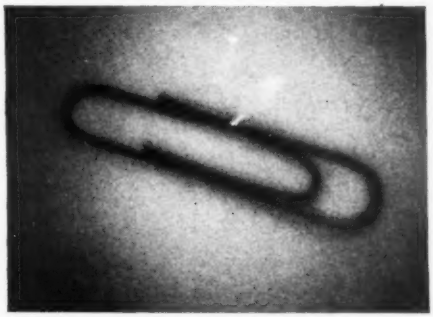
Develop the film after a day or so and you'll find the rays have fogged a circular area. The paper clip will show as a shadow. What you have is an "X-ray photo," or radiograph. Gamma rays are similar to X rays but of shorter wave length.

In 1896, French physicist Henri Becquerel first noticed what you have seen. Becquerel accidently left wrapped photographic plates next to some uranium salts. Several days later he developed the plates and found them fogged. He set out to discover why. The eventual conclusions, that exploding atoms send out rays and particles of themselves, set off the chain of research that finally led to today's mighty atom-bomb explosions. END



WHY ATOM WORKERS CARRY FILM. In atomic laboratories, employees wear identification badges called "dosimeters." At frequent intervals, the photo film inside the badges is developed. Fog, if any, on film shows how much radiation worker was subjected to.

A luminous-dial wrist watch will show you how little radiation it takes to affect film. Put a piece of unexposed film into a light-tight black envelope with the emulsion side up. On this rest a paper clip, sandwiched between paper folded once. Put the wrist watch on top of the whole business face down as seen above. Leave it for a day or so, develop the film, make a print, and you'll have shadowgraph below—made by atomic rays.



Ladder Treads Prevent Slipping

OLD rubber stair treads can make your stepladder a lot safer. Cut them to fit the steps, discarding the more worn front sections, and cement them in place. I used linoleum cement for the job but tacks can be used if you have no suitable rubber-bonding adhesive on hand.—*V. H. Lamoy, Upper Jay, N.Y.*

Twin Connectors Are Handy

DOUBLE-ENDED connectors, made by combining alligator and Fahnestock clips (below), are excellent for test and experimental work. You can use them for joining wires or attaching wires to all types of terminals.—*Charles T. Pearson, Le Mars, Iowa.*

Screened Porch Is Winter Prefab Job

By Bernard Gladstone
PS PHOTOS BY W. W. MORRIS

AUTHOR'S PORCH, on a rear corner of house, was open to mosquitoes and hot summer sun. Now (below) screening bars bugs and blinds stop sun.

You can add another room to your home—a cool outdoor room for the hot weather ahead—and 90 percent of the job can be done now in the warm comfort of your workshop.

IF YOU have an open porch that has never been screened, now is the time to stop toasting your toes before the fire and do something about it. For every winter hour you put in making screens in your cozy basement workshop, you'll be repaid whole evenings of cool comfort when hot weather arrives. A screened porch adds a delightful room to your house and gives you and your family a chance to enjoy the outdoors on a summer night without sharing it with mosquitoes, gnats and moths.

I screened my porch, and here are some useful points I learned doing it:

Screen width. When you measure the porch sides you intend to screen, remember that a screen wider than 42″ becomes weak in the center. On the other hand, if screens are narrower than 24″, too much wood shows when they are up. Divide the porch sides you measure so that each division is the width you want your screens to be.

If you want to have a screen door, allow 38¼″ for a 36″ stock door and its frame.

Screening. You have a wide choice of screening material and price.

Plastic and aluminum are the most expensive materials. Aluminum, widely used in defense work, is likely to be the costliest.

Plastic stretches more easily than other screening materials. This same stretch comes in handy if there are youngsters running around; the plastic gives rather than breaks, and snaps back into shape. Also, plastic doesn't oxidize. Therefore it doesn't stain frames or people's clothes. The only trouble with plastic is that it melts instantly if a burning object—say a lighted cigarette or match—touches it.

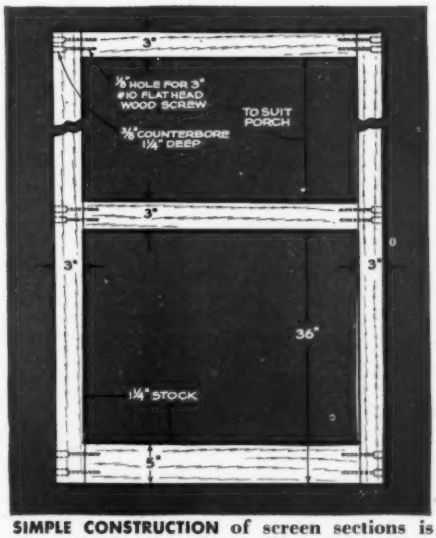
Aluminum, too, has the advantage of not oxidizing. It doesn't stretch as well as plastic, though. In very salty air, aluminum pits—and eventually breaks.

Copper is the most common screening material and it is cheaper than the first two. It stretches better than aluminum, but unfortunately it stays stretched. Furthermore, it may stain white woodwork.

Galvanized is the cheapest of all, but few stores in my neighborhood carry it. The zinc coating cracks easily and the wire underneath then corrodes fast.

Assembly. The drawings and photos show you how to build and install screens. These suggestions will help speed the work and give it a professional look:

- If the rafters of your porch ceiling are exposed, close up the outside ends or bugs will swarm in there. If there is space between the floor boards, cover the floor with linoleum.
- Prime all lumber before you put it up.
- Paint the frames of the screens before you tack down or staple your screening. It's best to use a stapler, but they are expensive. You can probably rent one.
- Use finishing nails everywhere except on the footing strips. Common nails will do for fastening them to a wooden floor. If the porch floor is concrete, anchor the footing strips with hardened cut steel nails.
- If the screening is to stay up all year, calk the joints where the frames meet the house and the porch columns. Calk the footing strips where they meet the floor. If you want removable screens, don't nail them up but fasten them at the top with turn buttons.
- Set the nailheads and putty over them before painting.

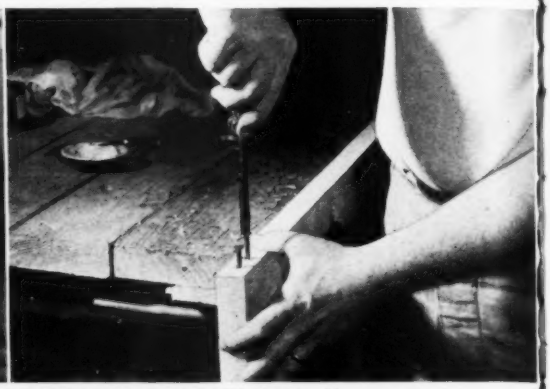


SIMPLE CONSTRUCTION of screen sections is shown in drawing above. All joints are butt joints held together with screws and glue.

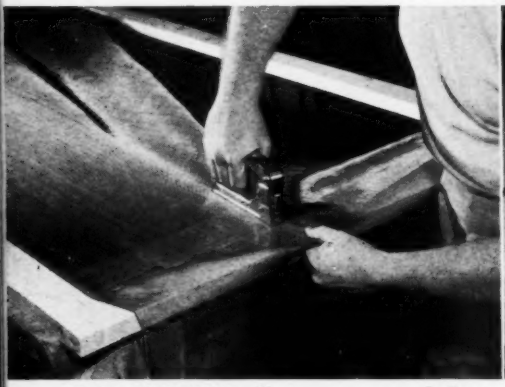
Please turn the page for step-by-step photos.

When winter winds keep you indoors you can do the jobs shown on this page in the snug warmth of your workshop.

FIRST STEP. After lumber is cut, drill two 1/8" holes through side frames at each joint for screws. Counterbore with 3/8" bit for 1 1/4".



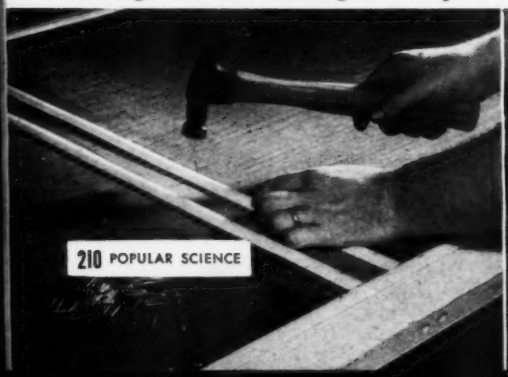
SCREW AND GLUE EACH JOINT. Use a waterproof glue and 3" No. 10 flathead wood screws. No clamps are needed.



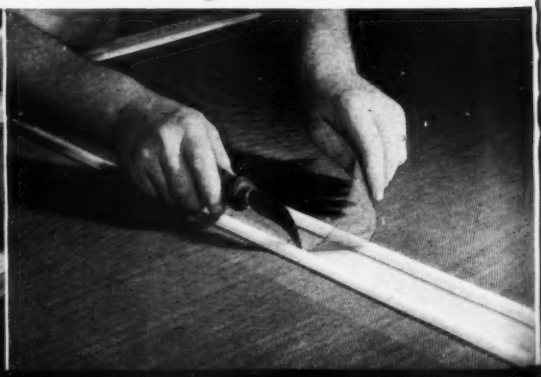
STAPLE SCREENING all across one end first. Then pull screening tight and staple other end. Staple across center divider last.

PAINT SEVERAL LENGTHS of 1/2" half-round molding at a time. The screen frames should be painted before the screening is applied.

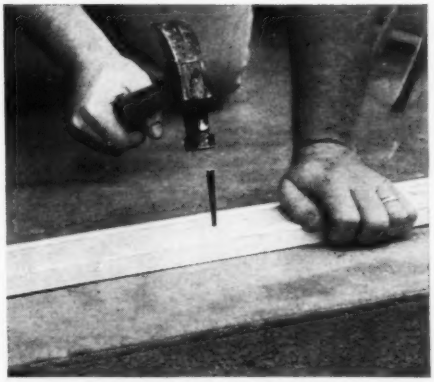
BRAD TWO STRIPS OF HALF-ROUND across center divider. Screening must be stapled along both edges of divider. Molding covers staples.



CUT OUT SCREENING ACROSS CENTER after you have nailed half-round all around edges. Linoleum knife is good tool for this.



Before spring breezes take over you can install the footings and frame for your prefab screened sections.



FASTEN 3/4" BY 3" FOOTING STRIPS to concrete floor with steel cut nails. Paint all sides of footing strips before nailing them down.

ANCHOR END BOARDS TO SIDING with long finishing nails. Use a level to make sure they are plumb before you drive the nails.

MARK OFF CONTOUR OF SIDING on 1 1/4" by 3" end boards with compass or dividers. Saw on these lines to make end boards fit snugly.

NAIL TWO 1 1/4" by 3" UPRIGHTS to footing strips and ceiling beam to form door frame. Fit frame tightly between ceiling and floor.

CUT A HEADER from 1 1/4" by 3" stock to fit between the uprights of the door frame. Allow 1/8" clearance at the top of the door.

Please turn the page

When buzzing mosquitoes arrive you will be ready to snap your prebuilt screened porch into place.

BUILD SMALL SCREEN for transom separately. Then nail it in place above the door. Use finishing nails, set heads, putty over them.

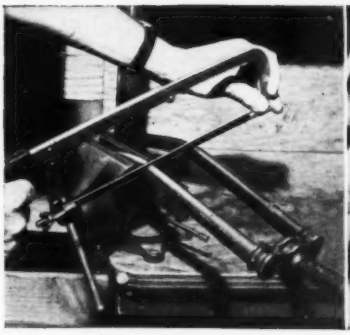
NAIL 5/8" QUARTER-ROUND MOLDING to outside edge of footing strips. If ceiling beam has no lip on it, nail quarter-round on beam, too.

PLACE BOTTOM OF SCREEN on footing strip with outside face against quarter-round molding. Then push top of screen in place.

LOCK SCREENS in position by nailing 5/8" quarter-round along inside edge of footing strip. Nail quarter-round along inside of top, too.

TOENAIL EDGES of adjoining screens to strengthen joints. Get a helper to back up screens at points where you are nailing.

NAIL 1/4" BY 1 1/2" STRIPS of wood over the joints between screens to cover the seams. Nail these strips on the outside of the screens. END

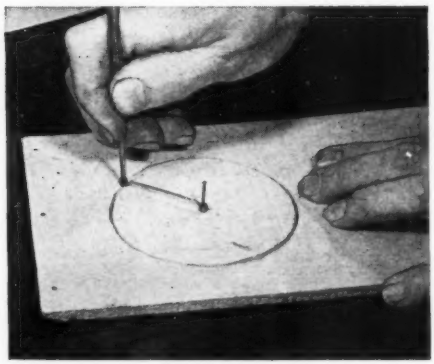


Trike Becomes Bike

If your child is outgrowing a tricycle but is still a bit too young for a regular bike, turn the three-wheeler into a two-wheeler. Because the converted job is partly familiar, it makes a fine "transition trainer" for youngsters unused to balancing. It costs only a buck or so for the conversion—far less than the price of a junior bike.

First, get an old front fork from a bike. Junk yards or bike-repair shops are good hunting grounds for this. Hacksaw off both arms of the fork at a point where it will just conveniently take one of the tricycle's rear wheels. Flatten the ends in a vise and drill them to take the rear axle, which is a rod threaded at both ends.

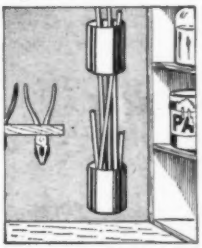
Saw off the tricycle frame at a point that will restore the original height of the seat when the new fork and wheel are put on. Align the fork carefully and drill through both frame and fork for a pair of bolts. Brazing the joint as well will make it stronger—*F. W. Bishop, Los Angeles.*



Holes Cut with Scriber

You can make big circular holes in thin wood panels with a scriber. Drive a nail where you want the center of the circle. Use a piece of wire (a paper clip will do) for the radius. In each end of the wire, bend loops to fit the scriber and the nail. Move the scriber around its circular path until the point cuts all the way through the panel.—*Walter E. Burton, Akron.*

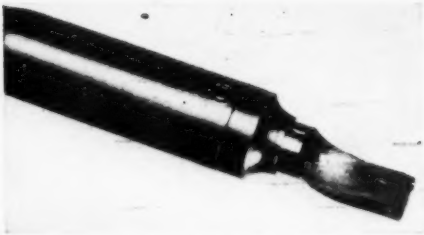
Tin Cans Hold Long Stock



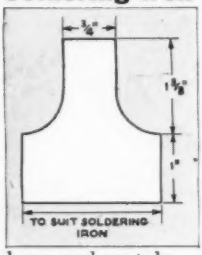
Dowel, molding and TV antenna elements may be neatly stored off the floor in tin cans. Just nail two cans (the upper one bottomless) to the wall as at right.—*Stanton R. Gaylord, Farmington, Minn.*

Jar Helps Small Spray Jobs

The feeder tube of a spray gun will not pick up small amounts of paint. A small glass jar provides a handy means of using small quantities and saves cleaning. Place the feeder tube in the jar and screw on the regular container.—*John Rea, Urbana, Ill.*



Soldering Iron Melts Shellac



By shaping a tip out of .020″ phosphor bronze you can convert a soldering iron into a tool for melting stick shellac, used to repair dents and scratches on furniture. It's much handier than the alcohol-lamp-and-spatula combination commonly used. Bend the large end of the bronze around a suitable bar and make it a snug fit for the socket of the iron. To use it, melt stick shellac on the tip and then draw the iron quickly over the scratch. For large dents, drip the shellac in and level it with the iron.—*Richard J. Decker, Brooklyn.*

Broom Holds Chisel Safely

When one man is driving a chisel and the other holding it, the holder's hands can be kept at a safe distance by using a broom to hold the chisel. Force the chisel through the broom as shown at right.

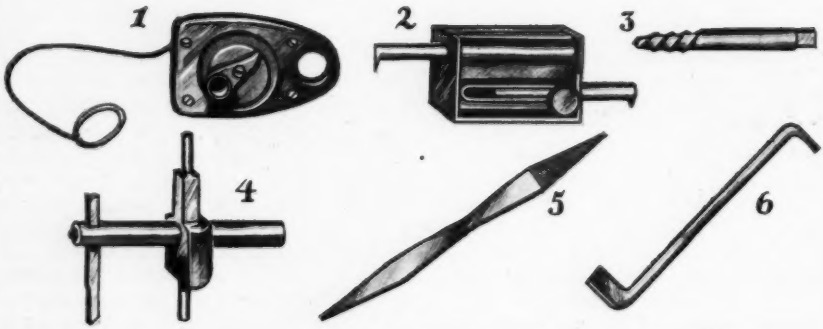
Beauty Aid for Auto Leather

Applied like paint, a new flexible coating is said to beautify and restore leather and canvas areas on cars. Ramcote Products, Chicago, makes it in a variety of colors.

TOOLBOX TEST

Sharpen up your knowledge of shop tools. Name these and invert the page to score yourself.

By C. B. Colby



1. Automatic chalk line; 2. butt gauge; 3. screw extractor; 4. circle cutter; 5. auger-bit file; 6. offset screwdriver.

SLIDING LID and carved initial make this handsome redwood jewel box a standout attraction on any woman's dressing table.

Build a Box for a Valentine

This project is easy enough for beginners, attractive enough for experts.

YOU will be as welcome as an income-tax rebate if you build a box like this. Any woman will want it for Valentine's Day or her birthday. When the box is finished, take it to a candy shop and have it neatly packed with chocolates. When the candy is gone, she can use the box to hold jewelry and those knickknacks that a woman accumulates on her dressing table.

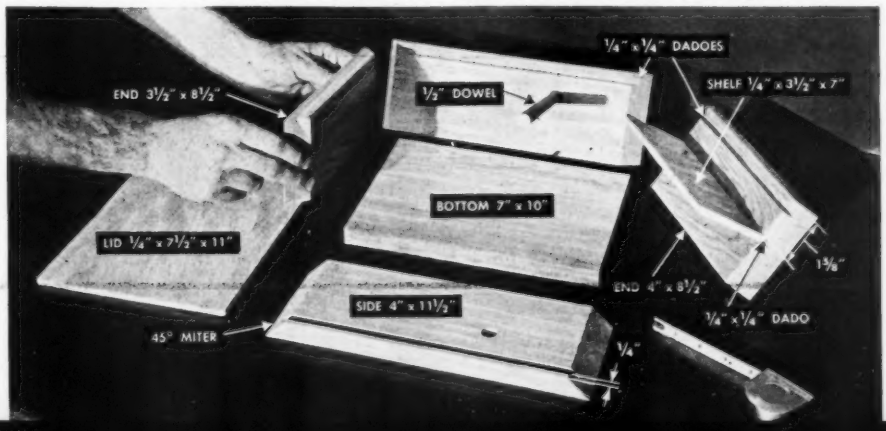
Construction. Building it is easy. You don't have to be an expert cabinetmaker and you don't need a shop full of tools. You can make all the cuts on a circular saw. The only other tools needed are a ½" drill to bore the blind holes for the dowel and a knife to carve the initial.

Build it with any clear-grained wood you have on hand. I used ¾" redwood for the sides, ends and bottom, and ¼" oak plywood for the top and shelf. The edge of the shelf is a ½" dowel that is glued to the shelf and set in blind holes in the sides.

Assembly. Finished dimensions of the pieces are indicated on the photo below, which shows what the parts will look like after they are cut to size. Join the parts with glue and finishing nails. Set the nailheads and fill over them with wood filler tinted to match the wood. Round the corners of the box and lid with sandpaper and sand all the wood smooth. The initialed finger grip can be carved by hand or routed out on a drill press. I made mine of redwood to match the box, cutting it to a rough circle ⅜" thick. It was deliberately carved crudely to resemble a knot. Then I glued it in place.

I finished the box with three coats of clear lacquer and rubbed it with paste wax. —*Darrell Huff, Sonoma, Calif.*

READY FOR ASSEMBLY, all parts of box are pictured below. Lid slides in rabbets. Rear of shelf is supported by rabbet and front is glued to dowel. Assemble with glue and nails.



Butler's Table Has Lift-Off Tray

Even if your butler is off duty, the convenience of this handsome table will earn it a place in the living room.

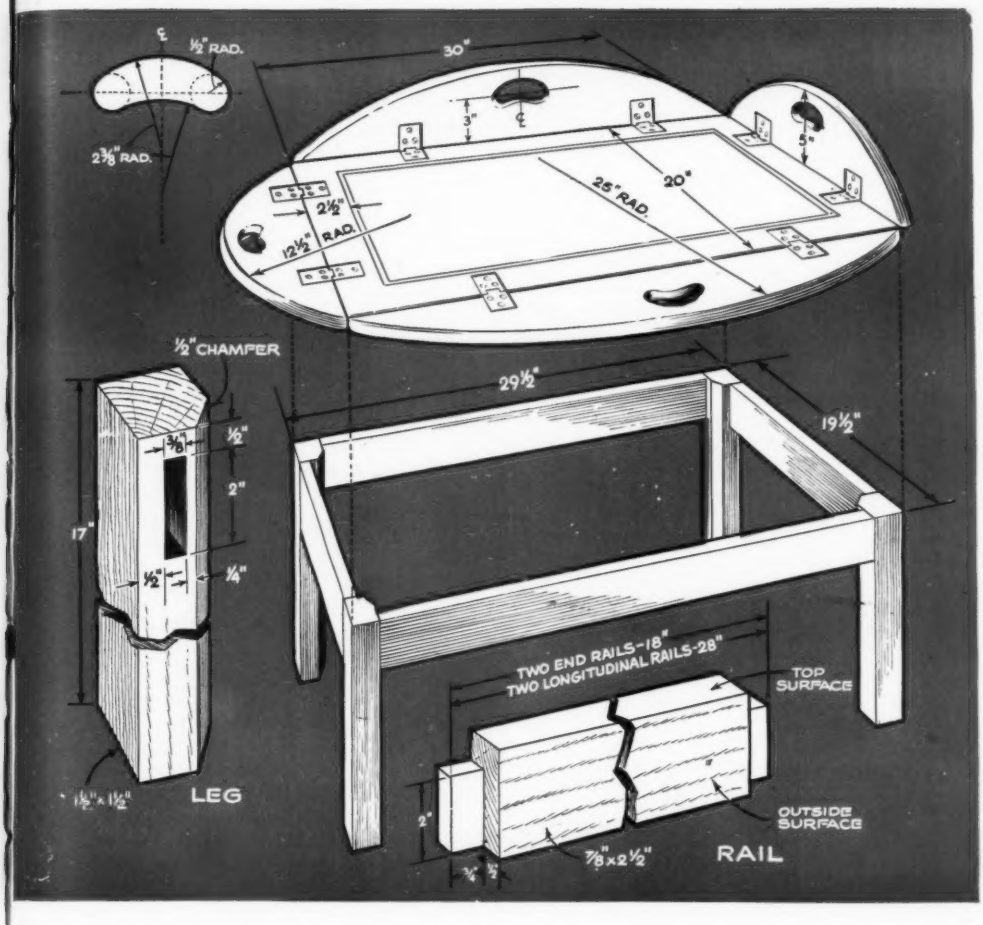
By L. E. Dufty

YOU don't have to have a butler to use a butler's table. Of English origin, the table was at first a serving tray. Later a base was added for convenience. This one, a handsome and useful table modeled along traditional lines, was built of solid mahogany at a cost of $25, which is about $100 less than a similar piece sold at retail.

The table top, or center section of the tray, is built up by jointing four 31″ lengths of 1″ by 6″ mahogany to form a slightly oversize surface 24″ by 31″. Plane the edges carefully, checking frequently with a square. Try the pieces together to obtain the best grain match and drill holes for ⅜″ dowels. Four dowels in each joint should be sufficient. Use a casein glue to join the pieces, as it sets slowly enough to give ample time for fitting and clamping and does not stain the wood.

Allow a full day for drying. Plane the top smooth on both sides using a plane at least 10″ long. Sand the top smooth and, after selecting the best matched area, cut it to the finished size, 20″ by 30″.

Inlay band. The edges are then planed and sanded and the outline of the ¼″ inlay band is penciled in about 2½″ from each edge. Rout or chisel a ¼″ groove in the wood a trifle shallower than the thickness of the



inlay—you sand the inlay flush after gluing. The inlay is next fitted to the groove with mitered corners. Glue, cover with paper and clamp with blocks to equalize pressure. When dry, sand through the paper till the inlay is perfectly flush with the top.

Table leaves are laid out with a string and pencil. The large leaves are drawn to a 25″ radius, the small ones to 12½″. The width of all leaves at their centers is 5″. Before cutting, check to be sure the radius layouts have given you the proper lengths: 30″ for the long leaves, 20″ for the short ones. A compass saw will do nicely for cutting the leaves.

Mortises for the hinges are outlined by placing the tray and leaves on a flat surface and laying the hinges in place, 6″ from the ends, with the barrels centered over the cracks between the pieces. Use a knife to cut sharp outlines and chisel out enough material to set the hinges flush with the wood surfaces. Hinges used on the table shown have a tension-adjusting screw set in an extra thickness of metal, necessitating a deeper mortise on the leaf side. The edges of the mortises should be deepened to accommodate the hinge barrels.

The hinges should be fitted, checked for easy folding and removed. Then the straight edges of the leaves and all edges of the tray should be rounded to a ⅛″ radius to prevent binding.

Handholes are laid out and cut identically on all leaves. Draw a line 3″ from the straight edge and parallel to it, and drill

STRING AND PENCIL make a workable compass for drawing the radius on each leaf. Keep the pencil vertical, the string taut.

two 1″ holes on this line, each 1¼″ from the center of the leaf. Back up the work with scrap wood to prevent the drill from splintering through. A 2⅜″ radius is then drawn tangent to the top and bottom edge of each hole and the material between the holes scroll-sawed out on these lines. Clean out the openings with a wood file and round off the handholes as well as the curved edges of the leaves to about ½″ radius.

The base is made up of four 2½″ rails—ripped from the remaining 6″ stock—joined to four 1½″-square by 17″ legs with mortise and offset tenon joints. A ½″ chamfer is cut on the inner corner of each leg to relieve the severity of squareness. Easiest assembly procedure is to glue the end rails to the legs first. When the glue dries, connect them with the front and rear rails.

The tray top may be turned face down, covered with wax paper and used as a guide for squaring the frame during assembly, leaving you free to check the legs to be sure they are perpendicular.

Cleats hold tray. You're risking your china and rugs if you rely on the weight of the tray alone to hold it on the base. Many builders attach the two units permanently, but you can preserve the basic idea by putting two cleats, 1″ by 1″ by 8″, on the underside of the tray to hold it in position on the base, yet permit instant removal.

LEAVES UP, the tray table occupies about as much space as a small coffee table. Extended, the leaves form an oval 30″ by 40″.

Finishing. Brown water stain is applied, using the following schedule:

- Remove hinges and dampen all surfaces to raise the grain. When dry, sand smooth with 5-0 garnet paper, open-coat. To be certain of a smooth finish repeat this operation.
- Shellac the inlay band to prevent discoloration from the stain. Use a fine brush and cover *only* the inlay.
- Brush on the stain. When dry, go over all surfaces with a wash coat of yellow shellac diluted with about seven parts alcohol to one part shellac.
- Allow a few hours for the wash coat to dry and rub down with fine steel wool.
- Fill the grain with mahogany paste filler. Cover a section at a time and rub it off before the filler dries hard. Allow it to dry overnight and sand lightly with 7-0 garnet paper. Then wipe clean with a rag moistened with benzine.
- Clear lacquer is brushed or sprayed on and allowed to dry for at least four hours. Smooth with 5-0 aluminum oxide paper and apply another coat. Four coats were similarly applied to this table, the final one being rubbed with pumice and water, using a felt block about 3″ square. Water is added at intervals during rubbing to keep the abrasive wet. When the desired finish is obtained, wash with a wet chamois.

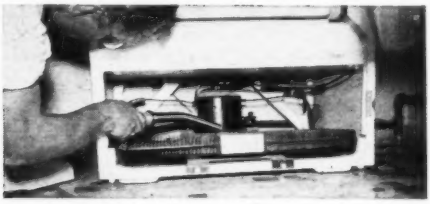
The pumice-and-water rubdown will produce a satiny surface, very pleasant to touch, and is usually all that is required to finish a piece of this type. Additional sheen may be obtained if desired by rubbing with rottenstone and oil on a soft cloth folded into a pad. END

Next month: An old-fashioned post lamp with plastic windows will decorate your yard —and also be safe from stones and BB shot.

Refrigerator Reminders

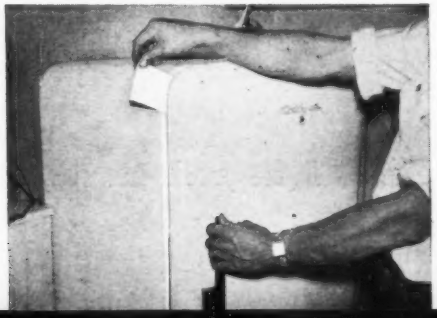
That gleaming new box will gleam—and perform—a lot longer if you put it on a regular diet of little attentions.

Defrosting. Necessary—if you don't have an automatic defroster—every two or three weeks with moderate humidity, every few days in sticky weather. Don't let more than 3/16″ of frost form; it insulates coils, retains food odors. Quick method (above): Turn control to off position. Remove trays. Put boiling water in freezer compartment. Overnight method: Turn control to defrost. After defrosting, wipe freezer dry, reset control. Never chip ice with tool.



Dusting. Every six months use your vacuum cleaner (above) to take the dust out of the mechanism compartment. Be careful not to bend any tubes or they may vibrate.

Checking the Door. Insert a card between door gasket and cabinet, as shown below. If you can slip card along with door closed, adjust latch strike for more tension. Loosen screws in strike and move it toward rear of box. Tighten screws, test again.

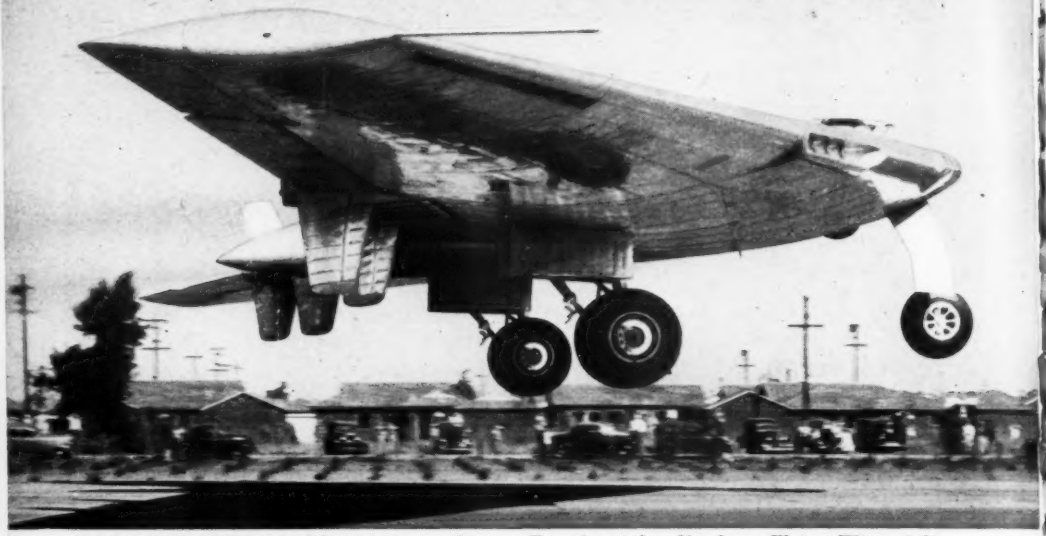


Cleaning. Wipe exterior each month with mild soap and water. Repeat with clean water. Use refrigerator wax to clean and protect surface. Don't use oily furniture polish or scouring powders. To clean interior (above), use warm water and baking soda or mild soap and water. Follow with clean water and wipe dry. Don't use wax, polish or cleaning powders on interior.

Storing Food. As a general rule, store foods in covered containers (below). This keeps moist foods from drying. Covers also stop food products from giving off or absorbing odors. Use plastic covers, aluminum foil or wax paper to cover open dishes.

How Flying Cameramen

If they don't fall out, pass out, get knocked out or have to bail out, they may get their pictures of a plane on its test flight.



FLYING WING TAKES OFF. It's easy to see where the photographer was standing as the Air Force's mighty Northrop Flying Wing eight-jet bomber took off. Too close for comfort.

LOOK OUT, PHOTOGRAPHER! As Bill Newman squatted on ground, the jet came down to eight feet before pulling into a climb. On first pass, suction upset the cameraman. The

Get Their Pictures

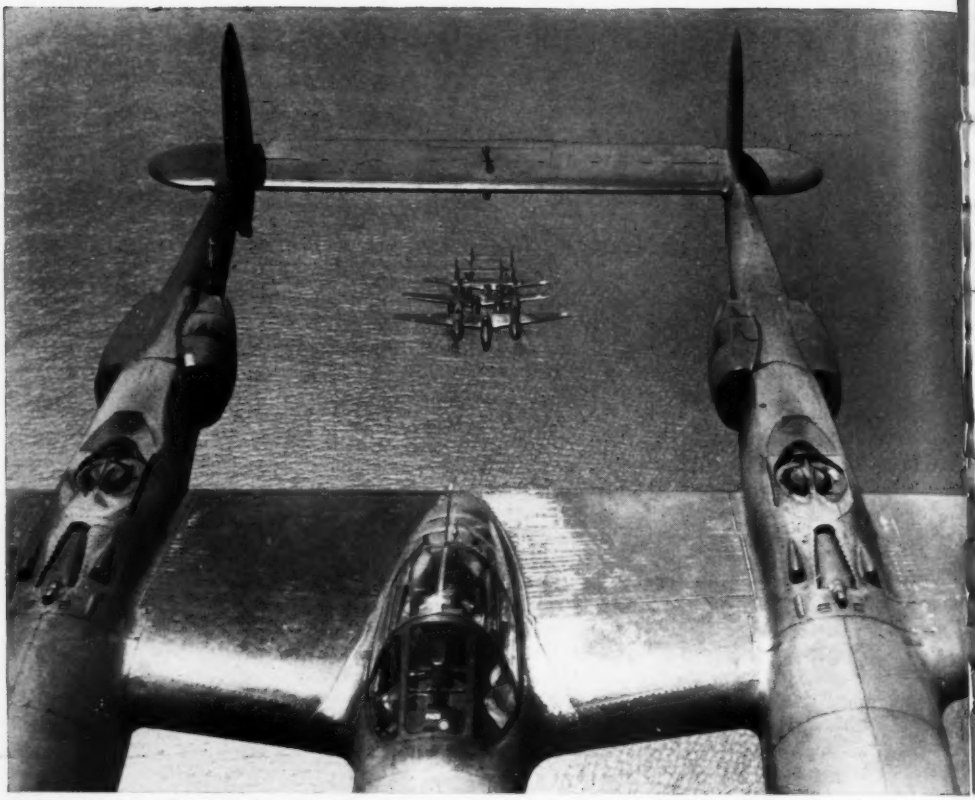
By Gordon Ashmead

IN THE middle of the long airfield a lonely figure knelt with his back to the wind, glanced into the distance, and raised his camera. Faster than the sound of its own blast, a jet dropped out of the sky and zeroed on the photographer. As the plane skimmed eight feet from the ground its suction flung the cameraman on his back. Then the gray blast from the engine picked him up and watchers saw a bundle of arms and legs cartwheeling in the dust and smoke.

"When he came over those hills it was too late to move," said test-photographer Bill Newman. "Next time I was sitting down, my knees up and the camera between them, and I got the shot."

Newman was making an engineering record of the bottom of a low-level dive. He belongs to a select little group of aircraft-company photographers. Aloft, these men

second time, he got picture below. At right, the business end of an aerial camera.



GOOD FRAMING. It took fine timing to get trailing ships framed through the empennage of this lead F-38. Erik Miller shot picture from open tail hatch of his plane.

CLOSE-UP—AND A CLOSE CALL. "When I made this head-on shot of a Constellation from the tail of a Lockheed Hudson," says Erik Miller, "we took off the rear hatch. I had to lie on a ramp that held my feet higher than my head. My helper rigged a rope across the ship and told me to wrap my feet around it. I did and wriggled out and looked right into the props of that Connie, 50 or 60 feet away. The job done, I inched back and found the rope I'd blindly trusted was held by two little wood pegs stuck into angles of the ribs. One was broken. Now I check such things myself!"

juggle Speed Graphics for Kodachrome shots, Fairchild K-20s for black-and-white and then a 16-mm. for movie work. If they shoot through plastic bubbles they get distortion and color interference. So they generally roll back canopies and open the bubbles or hatches or even the doors, when there are doors. Anything loose may be sucked out and often is—even occasionally a photographer.

Things happen to flying airplanes that even wind tunnels fail to show. Before a ship can go into production those bugs must be eliminated. If it's a tail flutter, a camera plane tracks the subject. It gets as close as is healthy—around 50 feet, just outside the slip stream. Telephoto lenses won't do because the long tube holding the lens exaggerates every movement of the cameraman and his plane. You have to get right in there.

Erik Miller has been in this business since

before the war. One time in the nose of a Martin with all his gear he found the subject ship 8,000 feet below them at the rendezvous. Miller's pilot tipped over the nose and Erik felt the deck drop from under him. The pilot saw what happened, thought it was fun and kept Erik suspended in the air with a series of roller-coaster dips.

Despite several close calls, Miller doesn't really think his job is dangerous, and Roy Wolford, head of Northrop Aircraft's Photographic Section, shares his view. Roy is an oldtimer and he is only 36. Yet he has been around airplanes for more than 20 years.

His long association with aircraft may account for Wolford's approach to his work. In the first place, he points out, before a photographer can go aloft in a military airplane he must be checked physically to the same standards the test pilots meet. Passing those, he must be indoctrinated in high-altitude flight in a pressure chamber. A group goes through together dressed in the high-altitude suits equipped with helmet, goggles, intercom mikes and oxygen gear.

Keep Your Mask on, Brother!

Oxygen masks operating, there is little difference from ground level, and some may be inclined to take the whole business too lightly. The instructors know how to deal with this. Roy was the guinea pig when he went through. At a simulated 18,000 feet his oxygen mask was removed and he was told to make a running report on how he felt.

"I felt fine," Roy told me, "it was easier to breathe without the mask and a bit heady. The instructor had me write my name on a pad. We went higher and higher and I still felt keen. I wrote my name again and then I noticed that the altimeter was reaching way up. I didn't feel bad, but things were getting blurry. My arm pained me where I'd broken it years ago. My ears were humming and it took a shake on the shoulder before I realized the instructor was saying, 'Write your name, write your name, where do you live?' Next, I wondered why the rest of the gang were looking at me."

Wolford had passed out and the other men in the chamber had a demonstration they will probably never forget.

G Forces Can Knock You Down

Not everyone is geared to flight. Some excellent photographers are too tense from unrecognized fears to do their work well. Most of the men I've interviewed agree that you should park your nerves on the ground.

JET ASSIST. That column of white smoke engulfed Val Hawes a second later, but he had his picture. The Northrop Raider, with six JATO rockets firing, was shot at 1/400.

It's a different world up there. When you snap the baby in the yard or sit down in your favorite chair you are encountering forces familiar to you—one-G forces. It is the same in level flight no matter what your altitude. But if your camera ship must go into a sudden climb you may find yourself operating under a two- or three-G force. That means that your 15-pound camera suddenly weighs 30 or 45 pounds.

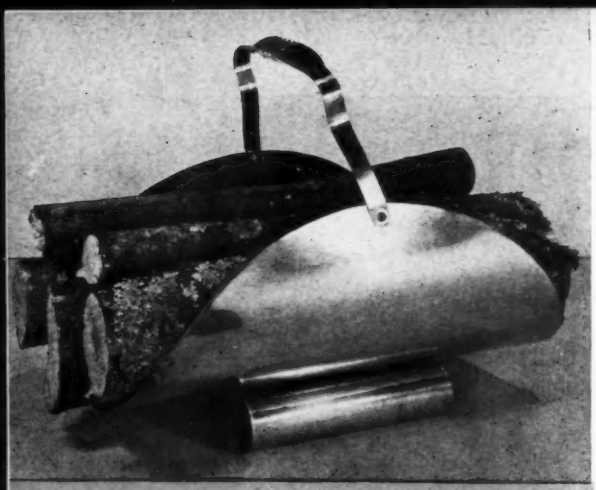
If you are a slight young fellow like Val Hawes, Roy Wolford's sidekick at Northrop, that sudden increase in your own weight and the camera weight can slam you down.

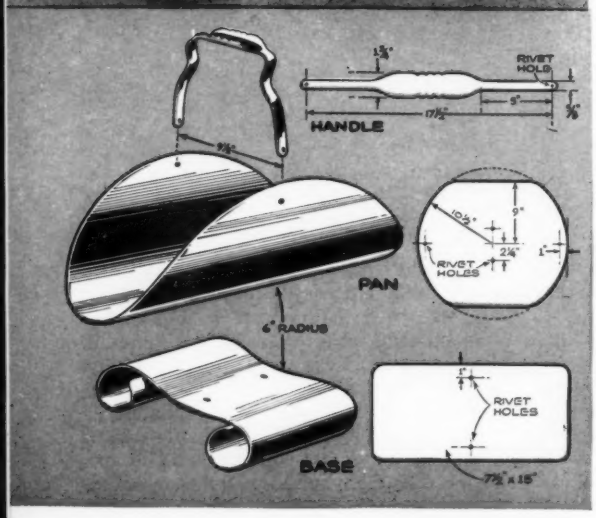
How to Lose a Cameraman

A photographer must know the pictures required and how they are to be taken. This is discussed with both pilots before the flight. In the air, both pilots receive direction from the photographer by intercom or hand motions. The cameraman hopes to get pilots with lots of flying hours and he prefers men he knows. In the late days of the last war a lot of hours didn't always mean an old pilot. Lew Nichols, shooting a Douglas transport, got a slight touch of religion finding that out.

Lew liked to shoot from a Beechcraft. It

[*Continued on page 246*]





One-Evening Shop Projects

Brass Basket Holds Logs. With a pair of tin snips and a few woodworking tools you can make a gleaming brass basket that will keep your firewood neatly stacked and add glamour to the hearth.

Lay out cardboard templates of the parts and scribe the outlines on a 21″ by 30″ sheet of .035″ yellow brass. Cut out the pan, base and handle, smooth all edges with a fine mill file and drill rivet holes.

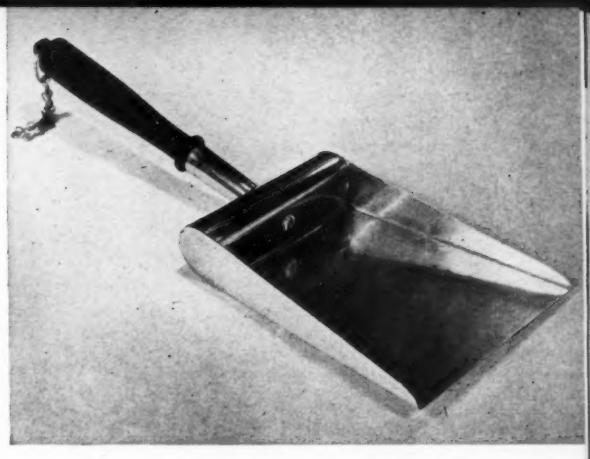
The main bending operations are pictured below. To make the scrolls in the base, clamp the brass sheet between a 1¾″ pipe and a flat metal bar, and bend the brass around the pipe.

Shape the pan by pressing the ends of the blank upward and inward until the bottom forms a smooth curve of about 6″ radius.

Form the sides of the handle with your fingers and use a woodworker's vise to bend up the scalloped center.

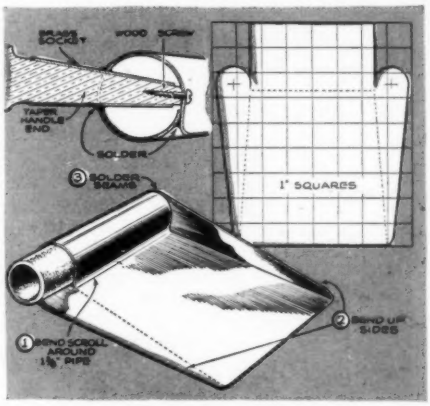
Buff the pieces and rivet the pan to the handle and base.

Building time: three hours.



Scoop Cleans Fireplace. This attractive companion to the log basket can be used either as a silent butler or for cleaning ashes from the fireplace.

Scribe the body outline carefully on .035″ yellow brass. When you cut it out, leave a little extra metal around the ears of the two sides. Clamp the blank in a vise and bend the rear tab around a 1⅜″ pipe to form a cylinder. Grip the two sides between wood blocks and bend them up to square-cornered right angles. Trim the ears to match the curve of the scroll back. Press the sides tightly against the cylinder and solder all seams.



You can turn a wooden handle on a lathe or use any you may have. In either case, taper the bottom 3½″ to a tip diameter of ½″. Wrap a brass socket around the tapered portion, drill a pilot hole through the roll back of the shovel, and use a pipefitter's tapered reamer to make a snug fit for the socket. Solder it into the opening and fasten the handle with a brass screw.

Scrape and file off excess solder. Lacquer the handle black and polish and buff the brass parts. If you have a place to hang the shovel, add a brass ring and chain to the handle.

Building time: four hours.

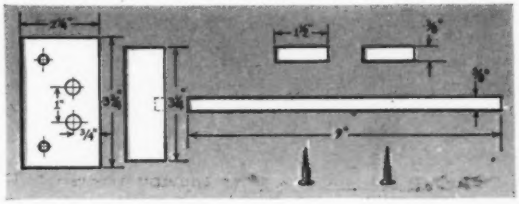
Mallet Helps in Kitchen. You'll probably find enough pieces of scrap to make this hardwood mallet, useful to tap open stubborn jar lids and stuck windows, crack nuts, pound meat or chip ice.

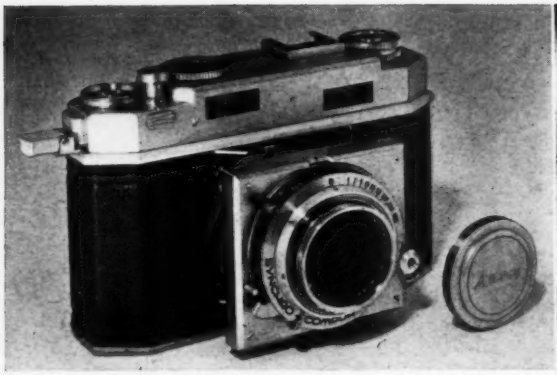
A broken hammer handle is good stock for the head. Cut the piece from the big end, and midway along a narrow side bore a hole about three-quarters through to receive the dowel handle. Glue the handle in place.

Bore the holes in the mounting block at a slight angle so the glued-in dowels will tilt upward.

Sandpaper well, rounding off all sharp edges and corners, and finish with a coat of shellac.

Building time: one hour.



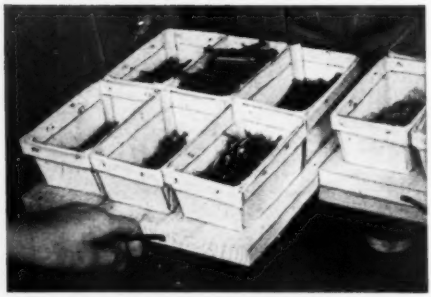


Two Fingers Work New Camera

ONCE you focus and set the diaphragm opening and shutter speed on this new camera, you can shoot a roll of 35-mm. film in a few seconds, using two fingers. One trips the shutter, the other operates a lever that both advances the film and cocks the shutter. Imported from Germany, the Ansco Karomet comes with a Schneider or Rodenstock f/2 lens, a synchronized shutter with speeds to 1/500 second, and a split-image range finder. It sells for about $175.

For beginners, Ansco now offers three camera kits containing everything needed for flash photography. The one shown at right above sells for about $30.

Berry Baskets Store Nails



BERRY baskets, tacked to boards the depth of your shelves, make handy storage bins for small hardware. Cover gaps at the basket corners with masking tape. Handles attached to the boards make it easier to slide them in and out on the shelves.—*Walter Haase, Hartford, Conn.*

Scoring Helps Hammer Grip

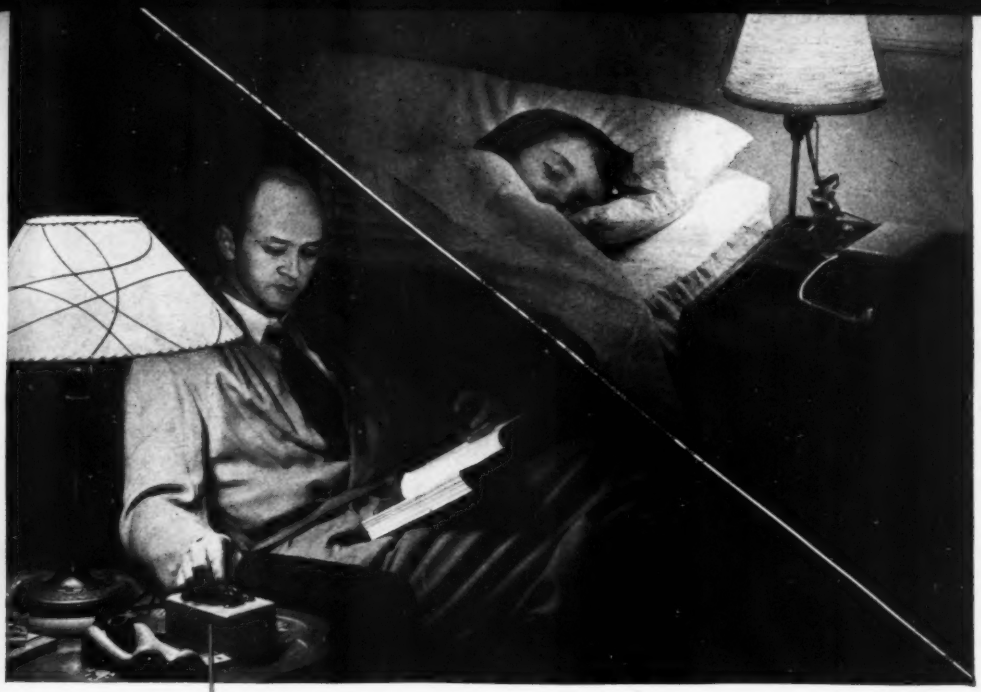
YOU can get a better grip on a hammer handle scored with a wood-burning tool as shown. This is cleaner and neater than wrapping with friction tape.—*V. H. Lamoy, Upper Jay, N. Y.*

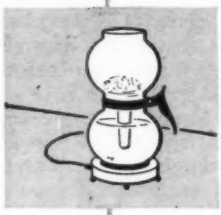
Tubing Pads Toolbox Handle

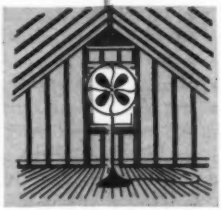
WHEN filled with heavy tools and equipment, even a small toolbox is hard on the carrying hand. A comfortable grip can be provided by splitting a piece of rubber tubing and taping it to the handle as shown above.—*John J. Rea, Urbana, Ill.*

Cold-Light Tube Flashes Signals

A COLD-CATHODE tube in this electronic signal flasher produces a bright light visible for about a mile. Three 90-volt batteries provide current. The maker, Haledy Electronics Co., New York City, says batteries last longer and visibility is greater because no current is wasted to make filaments glow or to run moving parts.







Robot Messenger Saves Steps

"Wired wireless" runs this portable switch that plugs in anywhere to control lights and appliances someplace else.

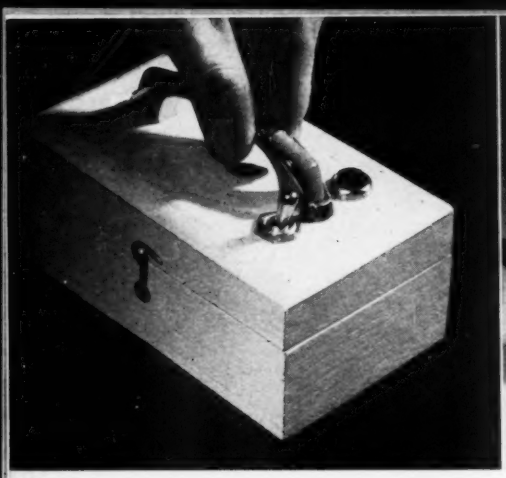
By Howard G. McEntee

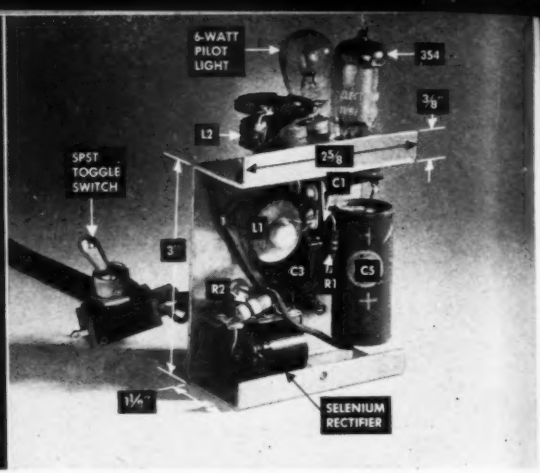
THIS electronic errand boy will operate almost any electrical device in your house or even in your neighborhood. With it you need only stretch out your hand to start the coffee brewing downstairs, turn on a fan in the attic, put out a light in the upstairs nursery, silence a radio in the next room or floodlight the yard and driveway.

Essentially it is a portable electric switch that turns power on or off from a distance. Half of it is a tiny radio transmitter that is built into a cut-down file box. It sends its signals over the two-conductor 115-volt AC wiring found in nearly all homes. The receiver—the other half—can be plugged in anywhere on the same electrical circuit. It picks up the commands pulsed out by the transmitter and opens or closes a relay switch.

Both halves of the control system can be left plugged in and waiting for your orders because the receiver uses practically no current while it is standing by and the transmitter takes none at all.

Transmitter. A miniature 3S4 tube generates a radio-frequency signal when the power switch is closed. The signal





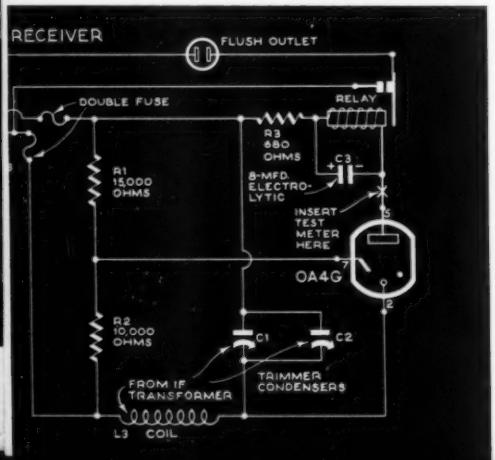
PARTS FOR THE TRANSMITTER

175-kc. center-tapped air-core IF output transformer (Meissner No. 16-3731, Miller No. 512-K3 or equivalent). Transformer is cut in two. One part (L1) is used in transmitter, the rest in receiver.
2.5-mh. radio-frequency choke.
250-mmf. mica condensers (2 required).
.001-mfd. mica condenser.
.002-mfd. mica condenser.
20-mfd., 200-volt electrolytic condenser.
56,000-ohm, ½-watt carbon resistor.
39-ohm, ½-watt carbon resistor.
65-ma. selenium rectifier.
6-watt, 115-volt miniature lamp.
Candelabra socket and jewel light for above.
3S4 tube and miniature socket.
SPST toggle switch.
Double fuse holder and two ½-ampere fuses.
Line cord and plug.
3" by 5" wooden file box.
Terminal strips, chassis, miscellaneous hardware.

is fed back to the power line through a condenser (C4).

The tube has an instant-heating filament designed to work off a three-volt battery. It is wired to the 115-volt line in series with a 6-watt pilot light that reduces the voltage on the filament and also serves to show when the transmitter is on.

All transmitter parts fit easily inside a 3" by 5" wooden file box cut down to a total inside height of 2". Except for the switch—which goes on the box lid—all parts are assembled on a chassis bent up from a strip of 1/16" aluminum as shown above.

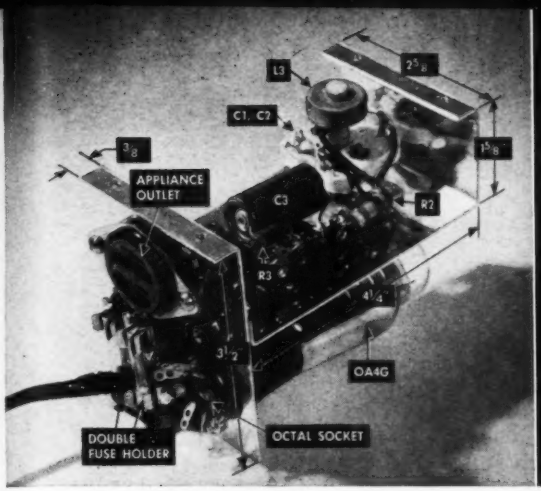


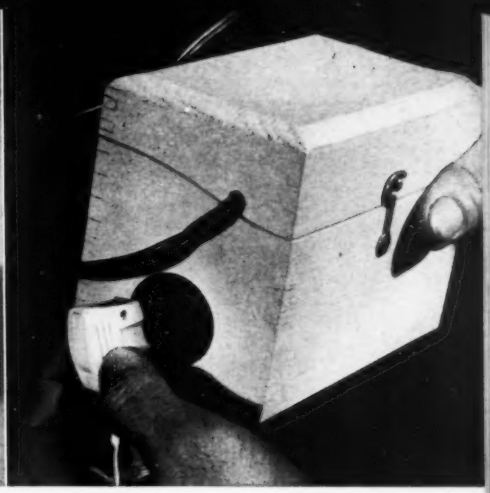
The radio-frequency choke (L2) was placed on the outside bend of the chassis for convenience and to keep it separated from the transformer coil (L1). You can rearrange the other parts any way you like, but don't put the two coils side by side.

Receiver. The chassis of the receiving unit is made up of an upright leg bolted to a horizontal L. Electronically the arrangement of the parts is not critical, but some of them are fairly large so you have to lay them out carefully to get them into a full-size file box.

The OA4G is a gas-discharge tube. In stand-by operation it draws very little current from the line. When a signal reaches it, the gas "fires" and the tube becomes conductive. As soon as this happens, current flows through the relay coil and pulls in the contact. This, in turn, connects an appliance outlet directly across the 115-volt line. Anything that is plugged into the outlet starts getting juice. The outlet is an ordinary flush-type unit.

Making chassis safe. Both transmitter and receiver use a transformerless circuit with the ground return connected to one side of the 115-volt line. Ordinarily this results in a "hot chassis," but there are three





PARTS FOR THE RECEIVER

Coil and two trimmer condensers (L and C1, C2) from IF transformer (see text and parts list at left).
8-mfd., 150-volt electrolytic condenser.
15,000-ohm, ½-watt carbon resistor.
10,000-ohm, ½-watt carbon resistor.
680-ohm, ½-watt carbon resistor.
115-volt AC relay, SPST normally open, or SPDT (Guardian No. 18380, Advance No. K1504, Potter & Brumfield No. MR 1A or MR 5A, or equivalent).
Flush-mounting appliance outlet.
0A4G tube and octal socket.
Double fuse holder and two ½-ampere fuses.
Line cord and plug.
3" by 5" wooden file box.
Terminal strip, chassis, miscellaneous hardware.

things you can do to eliminate any possible hazard:

1. "Float" the chassis. Connect all common or ground leads with insulated wire and do not bring them into electrical contact with the chassis. Note that the diagrams do not show any chassis grounds.

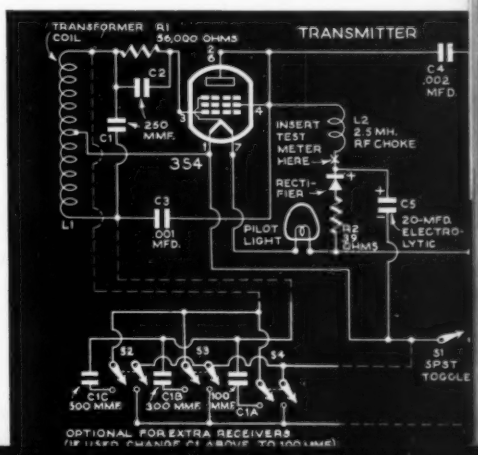
2. Fuse the line. A double fuse holder is shown in both circuits. Fuses of ½-ampere rating will open up fast in the event of any accidental short. The fuses do not affect the relay points or appliance outlet. The amount of juice you can draw for appliances is limited only by the current-handling capacity of the relay contacts.

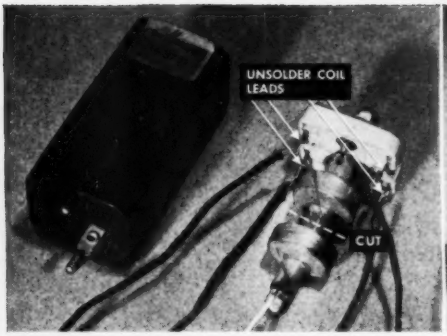
3. Insulate the boxes. Use wood or plastic, not metal containers. Recess the screws that hold the chassis to the box and coat the screw heads with cellulose cement.

Any of these dodges gives pretty sure protection. All three together make the electronic messenger about as safe as an insurance policy.

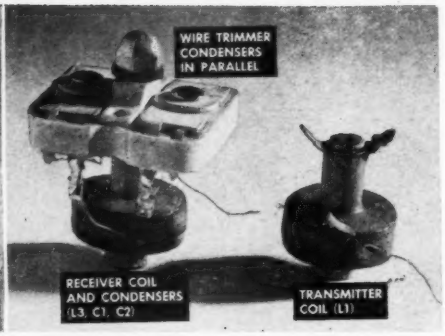
Testing and aligning. When you have both units fully wired, turn on the transmitter. The pilot lamp will light up brightly and the tube will glow dully. Break the circuit at the point marked X in the diagram and insert a milliammeter of about zero to 50 range (plus side to rectifier). It should read between eight and 11 milliamperes. If it goes higher or lower recheck the wiring and try a new 3S4 tube.

Next insert the meter at X in the receiver. The needle should jump to about 20 when the *transmitter* is turned on, but it probably won't until you have tuned the receiver to the transmitter frequency. Do this by adjusting the trimmer condensers. Turn either one of the two trimmer screws all the way in and then play with the other till you get the highest current reading. If the meter shows more than 25 milliamperes, increase the re-





A TRANSFORMER cut in two provides a coil for the transmitter and a coil and two trimmer condensers for the receiver. Since they come from a single unit, the sending and receiving coils are sure to match. The unit shown is a 175-kc. IF output transformer with a center-tapped coil. It is sometimes called a "push-pull" type. A transformer made for 262-kc. intermediate frequency could also be used.



Remove the insides from the shield can and unsolder—do not cut—the fine wire leads from the terminal lugs. Saw the wooden shaft through the middle to separate the coils. Use the center-tapped coil (with three leads) in the transmitter. Leave the other coil attached to the trimmers and mount them as a unit in the receiver. Wire the trimmers in parallel as shown in the diagram.

sistance of R3; if less than 20, reduce R3. Excessive current may damage the tube; too little won't let it fire reliably.

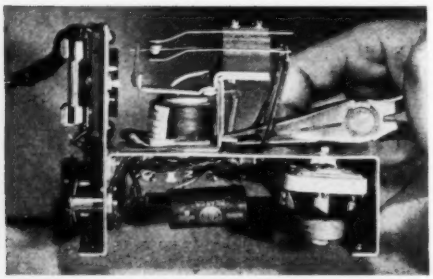
Remove the meter and make the rest of the adjustments by eye and ear. When you close the transmitter switch, the receiver tube should fire. A blue-purple glow inside the tube shows when this is happening. If the tube doesn't fire, your line voltage may be lower than normal. You can compensate for this by decreasing R1 to about 12,000 ohms. If the tube fires but the relay is sluggish, adjust the spring or armature.

Add extra receivers. One transmitter will operate any number of receivers, but if they are all made exactly alike they will go on and off together. If you would like to work several receivers selectively, change transmitter C1 to 100 micromicrofarads and add extra condensers and switches as shown at the lower left of the transmitter diagram.

For each extra receiver add a double-pole single-throw switch at the transmitter. Each switch closes the power circuit and connects its own condenser across the tuning coil, thus providing a different frequency.

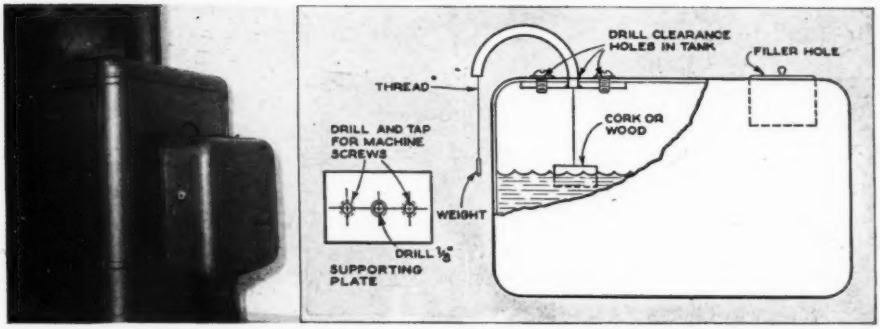
Tune each receiver to respond to only one transmitter frequency. If adjusting the trimmers will not accomplish this, add fixed mica condensers (100 micromicrofarads each) in parallel with the trimmers until it will. If you use multiple receivers, close only one transmitter switch at a time.

Like other carrier-current rigs, these units will not bridge the two sides of a three-wire supply. If your house has a 230-volt, three-wire supply system, you will have to locate the transmitter and receiver so they share the same side of the line. On the other hand, the signal will travel back along a conventional 115-volt, two-wire line until intercepted by the pole transformer. This means that in many cases you can send or receive between neighboring houses. END



THE RELAY may have to be adjusted slightly for proper operation. If it doesn't close reliably when energized, reduce the tension of the spring and bend the armature closer to the magnet coil and the contact arms closer together. The relay should close an instant after the OA4G tube begins to glow.

Many different relays will work in this circuit. The unit you buy should have a 115-volt AC coil and a DC resistance between 500 and 1,000 ohms. Be sure it has heavy-duty contacts because all current drawn by any appliance it controls flows through the relay points.



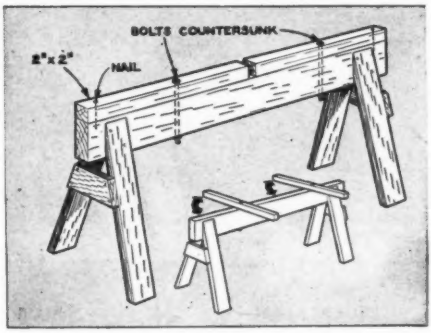
Gauge Shows Kerosene Level

TIRED of stabbing a ruler into a heater tank to measure the kerosene level? This indicator tells at a glance when to fill 'er up.

Bend a length of ⅛" copper tubing and solder one end to a pre-drilled supporting plate. Push a few feet of carpet thread through it and tie one end to a small block of wood. Drill three holes in the tank.

Install by reaching in the filler hole and pushing the tube through from inside. After determining the length needed to indicate "full" and "empty," tie a light washer to the free end of the thread.

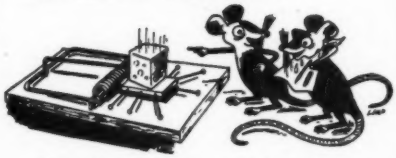
The gauge could also be installed on the filler cap.—*D. Synette, Longuevil Annex, Que.*



Sawhorse Holds Wide Work

ONE sawhorse will support wide work if you fasten two pivoting arms on the top (left). When not in use, the arms can be swung parallel to the top and held by nails dropped through holes in the arms and top. —*W. Shields, Bloomington, Ill.*

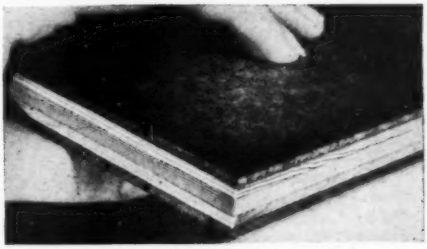
My Most Ingenious Solution



The mice in our house mistook the traps I set for free-lunch stands. When I got tired of feeding them bait, I dreamed up a better way to hair-trigger the traps. Now the snapper beats Mr. Mouse to the cheese.

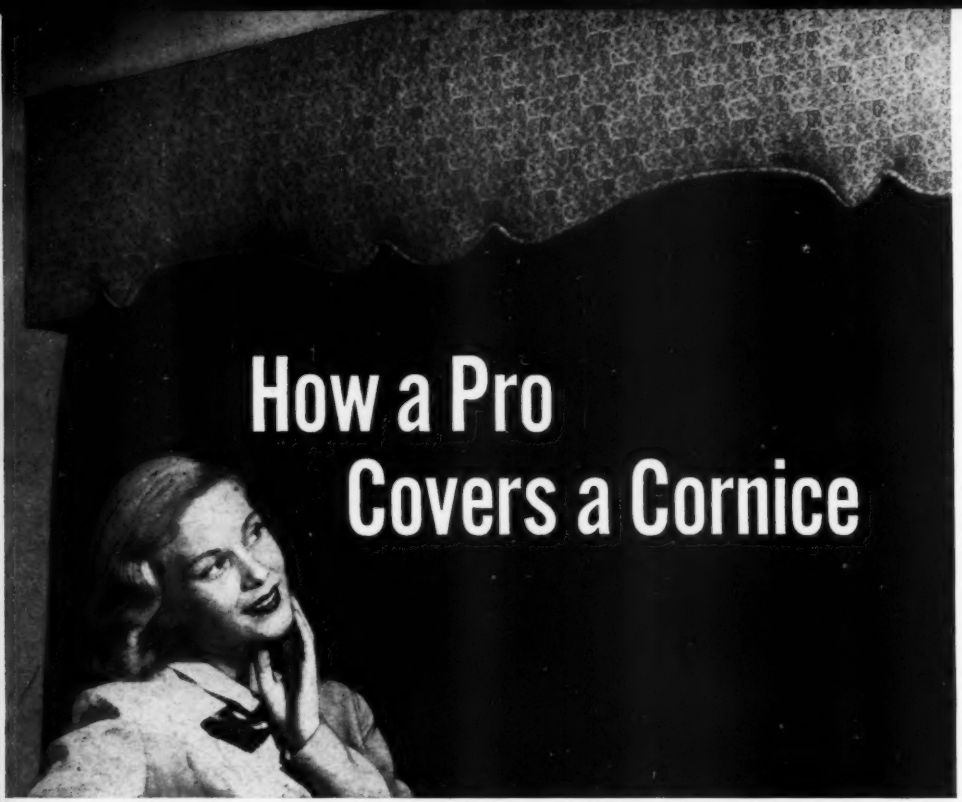
I stuck straight pins in the treadle all around the bait hook. The mouse has to step on or move one of the pins in order to reach his last meal.—James E. Ingram, Kansas City, Mo.

Hardboard Faces Plywood

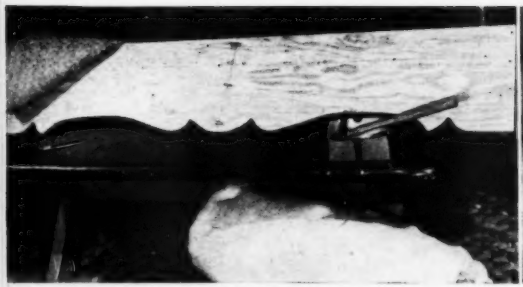


THE hardboard outer faces of the new type of panel above provide smooth, easily painted surfaces, while the plywood core gives it strength and rigidity.

Called Plyron, it is made in 4′ by 8′ panels ⅜" and ¾" thick. It is being used for concrete forms, flooring, cabinet doors and table tops. At present it is used almost exclusively in industry but is expected to be available at retail lumberyards in the near future.



How a Pro Covers a Cornice



1 MATERIALS AND TOOLS needed to cover cornice are shown above. Cotton batting is on floor. Cover fabric—lying across cornice—can be plain or quilted. Use No. 6 tacks.

2 COTTON BATTING is lined up with top edge, tacked, and trimmed to fit sawed design. Use two layers of batting. Hold it with left hand and pull up and out with other hand.

5 BOTH RETURNS have been fully tacked and fabric turned over top and tacked to back. This forms firm edge to pull against when stretching fabric over design in bottom.

6 COVER FABRIC is coaxed over design by stroking it with one hand while pulling with other. Slit fabric up to cornice at all valleys in the design along bottom edge.

Nothing to it when you follow these simple rules. The tools you need are hammer, saw and pair of scissors.

By Paul F. Illes

ALMOST every day people drop into my upholstery shop and ask about cornices. How do you make them? How do you cover them? Is it a tough job? Do I need a lot of tools?

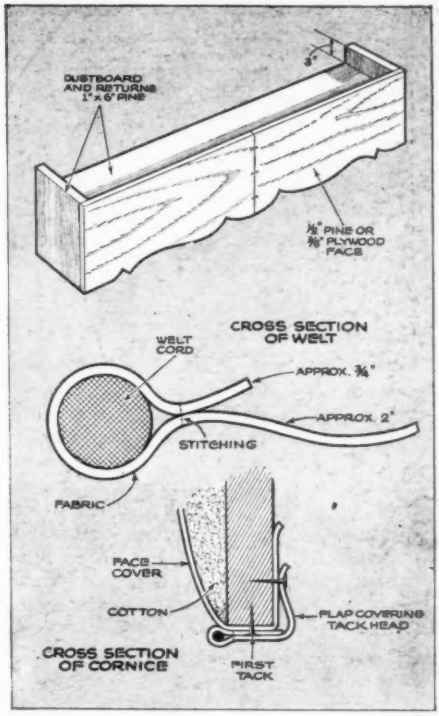
The answer to the last two questions is a big "No." The answers to the first two questions are detailed on these pages.

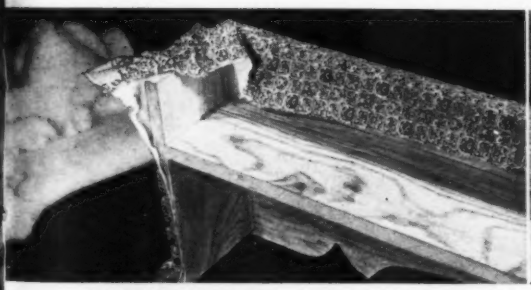
Sometimes "cornice" is confused with "valance." In the upholstery trade, a valance is a short drape across the top of a window. A cornice is a box with a painted or upholstered face.

An assembled cornice is shown at left. You can build one like it with a little lumber, a hammer and a coping saw or jigsaw.

Start the covering operation by putting on the batting. From there the photos take you step by step to the finished job. When you cut out the cover fabric, leave a 2" to 3" lap all around.

Most professional upholsterers line the cornices they make. If you want to line yours, use sateen or any light material. END



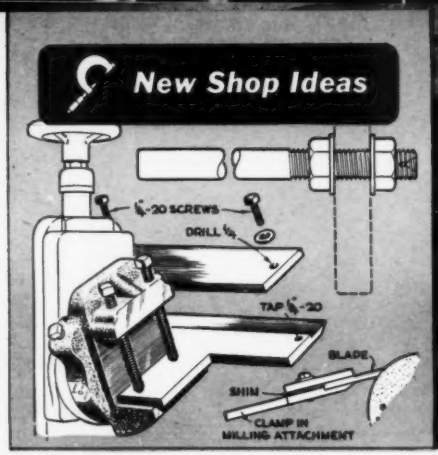


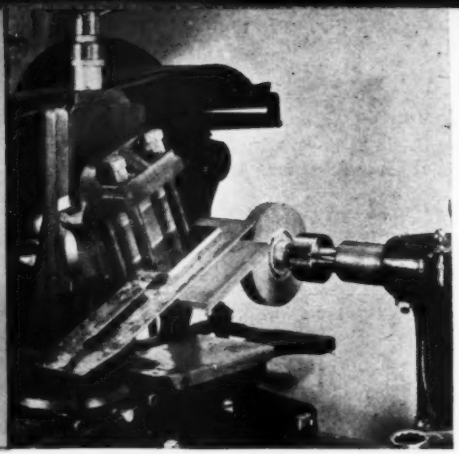
3 COVER FABRIC is partially tacked to one return. It has been pulled up over top of cornice so pattern can be checked to see that it is lined up with the top of cornice.

4 FULLY TACKED to one return, cover fabric is pulled tight. Pulling fabric takes out most of the wrinkles. Hold it tightly while you tack it to the second return.

7 BEFORE TACKING, cover fabric is pulled tightly into valleys. Cut V-shaped notches and retack until smooth. If you have no magnetic hammer, start tacks with thumb.

8 WELT IS PUT ON with blind tacking. Short flap is tacked to cornice edge. Then long flap is pulled over short flap, tacked inside. Welt can be bought or made from fabric.



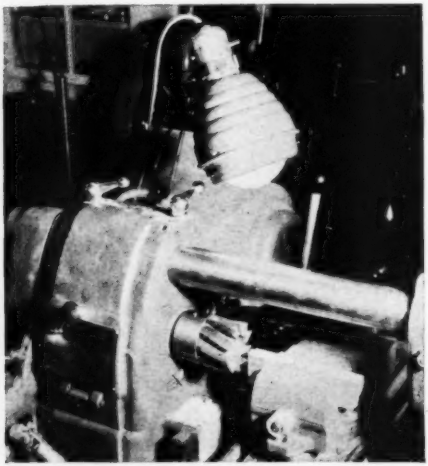


Lathe Sharpens Tools. A perfect hollow-ground edge, at any specified angle, can be produced on plane irons, jointer cutters and wood chisels with this lathe setup.

A 4″ grinding wheel is permanently mounted on a ½″ shaft about 10″ long and trued up in the lathe with a diamond-point dressing tool. Once set up, the shaft may be removed and replaced in the lathe without further truing. A ½″ collet is best to hold the head end of the shaft, while the tail end is steadied by the tailstock center. Use a ball-bearing center if you have one.

The blade is clamped in a milling attachment between two slabs of metal or hardwood, tilted to the desired angle and accurately guided across the grinding wheel by slow movement of the lathe carriage. Between passes, advance the cross slide no more than half a thousandth and wipe the blade edge with a wet rag to keep it cool. Cover the lathe bed with a cloth or paper to protect it from grit.

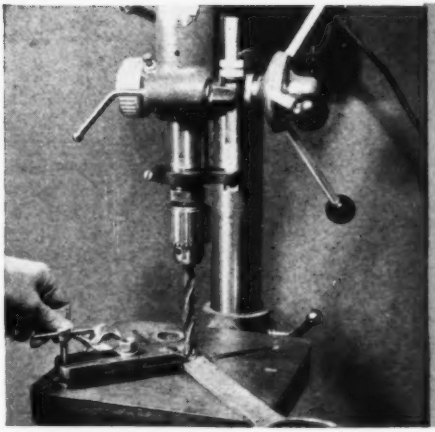
Long irons, up to a 12″ planer blade, can be securely clamped in the T-shaped holding jig illustrated. Rack the carriage back and forth a few times to be sure the blade is properly aligned and making contact with the grinding wheel at both ends. *—H. L. Truchelut, Atlanta.*

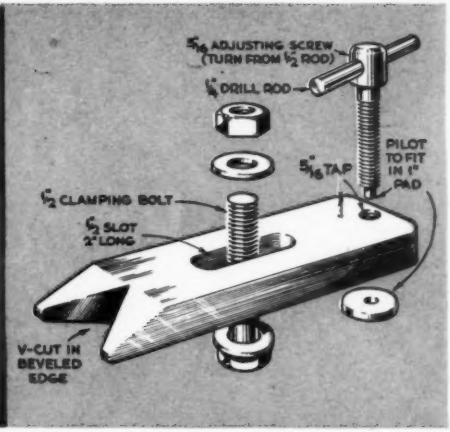


Light Where You Want It. An inexpensive bed lamp serves as a small spotlight for use on power tools, focusing light right on the point of action. The swivel-joint spring clamp can be quickly attached to a convenient part of the machine.

Plastic Lens Mount. A set of two or three matched but unmounted lenses, giving a magnification of about 10 times, can be mounted in this Lucite stand to become a useful shop accessory for fine layout work, inspecting small parts and reading rules graduated to sixty-fourths.

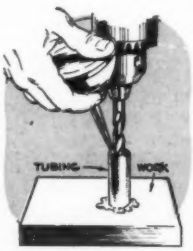
The lens barrel is bored from 1¼″ rod with a knurled shoulder for easy focusing. Lenses are set on retainer rings cemented in place. (Spacing recommendations are usually provided with lens sets.) The base, also 1¼″ rod, is bored to a tight fit over the lens barrel. An opening is cut in the side of the base to admit light. A vertical slot is cut above this opening to permit the base to spring open slightly when the barrel is inserted.*—Floyd McGuckin, Ridgewood, N. J.*





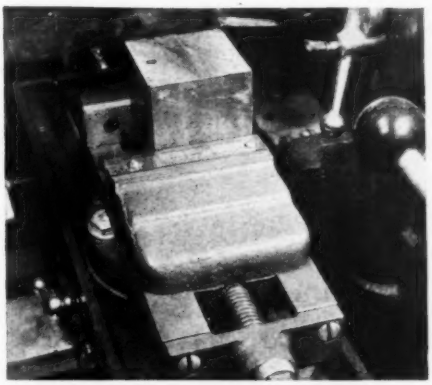
Quick-Set Clamp. Faster to set up than a C clamp, which is often clumsy or too short, this efficient drill-press clamp is patterned after the hold-downs used on slotted machine tables. Make it up from a 5″ piece of ½″ cold-rolled steel 1½″ wide. The V at its holding end grips the work securely and allows clearance for the drill. To use, adjust height with T screw and tighten nut with wrench.—*Joseph Tracy, New York City.*

Emery Cloth Tears One Way. Because of its weave, emery cloth will tear evenly the long way only. Ripped across its width, a sheet will have two buckled and ragged edges that continue fraying with use.—*H. L. Engstrom, Seattle.*



Tube Holds Oil. Dry drilling often shortens drill life, and even when a coolant is provided, it may be thrown off before it reaches the cutting lips. For your tough drilling jobs, slip a bit of loose-fitting neoprene tubing over the drill. Squirt oil into the tubing, which will take it right where it can do the most good. Lift the sleeve frequently to clear out chips, add more oil and continue drilling.—*W. Shields, Bloomington, Ill.*

Razor-Blade Shim. Needing a shim to make an oversize pulley bore fit a shaft, I tried a double-edged razor blade. After heating it to draw the temper, I bent it around the shaft, and it served nicely. Razor blades vary a bit in thickness, so by trial you may find one that's just right.—*Leo Merkel, Lucca, N. D.*



Vise Rule Saves Time. A section of a broken machinist's rule, attached with two small screws to one jaw of a miller or shaper vise, will speed setups for roughing operations. It can be used to provide a reference mark when work must be reversed or repositioned for additional machining.—*Will Thomas, Buffalo.*

Drop-Proofing a Lathe Chuck. Here's a way to remove a heavy lathe chuck without dropping it on your fingers or the ways. Loosen the chuck a bit and hold it while you pull the V belt backwards. When the spindle nose unscrews itself, you've got the chuck in your hand.

Engraving with Phonograph Needles

You'll never print a buck with this engraving setup, but with practice you can make a few by monogramming valuables for friends.

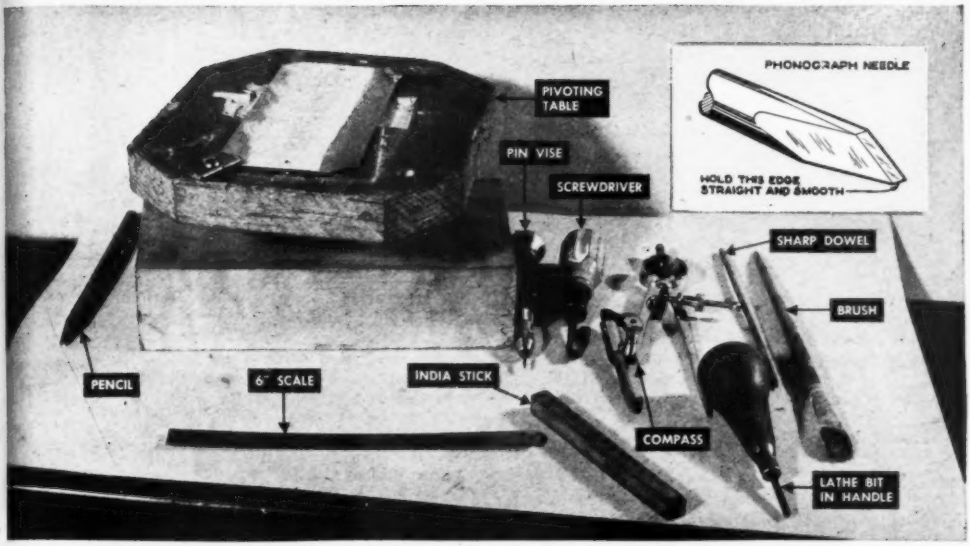
By E. F. Lindsley

WHEN you engrave your monogram on a precision tool or cigarette lighter, it is identified as your very own. The letters are cut in deep, without the distorting impact of stamping or the corrosive fumes of etching acid. They cannot be removed without severe and obvious grinding.

Improvised tools. Materials usually found in the home can be made into tools that will get you off to a good start. For example, the pivoting work table can be made from two blocks of scrap wood, the upper half turning on a ball bearing held by a bolt. The pivoting table is important, since it permits the work to be turned as you cut curves. Without it, the wrist must bend on the curves and often gets into awkward positions, encouraging those heartbreaking slips that leave ugly—and permanent—gashes in the work.

Phonograph needles provide a good supply of high-grade steel for the cutting tools. They are held in a pin vise, which fits comfortably in the palm of the hand. For cutting periods, whirls or scrolls, a 3/16″ lathe bit, ground diagonally to form a diamond point, can be fitted into an undersize hole drilled in a file handle. A medium India stick should be kept at hand to hone the tools occasionally.

Lay out the letters with a pencil, by writing on shoe whitener that is brushed on the work. A short length of ¼″ dowel, sharpened to a point, should be used to



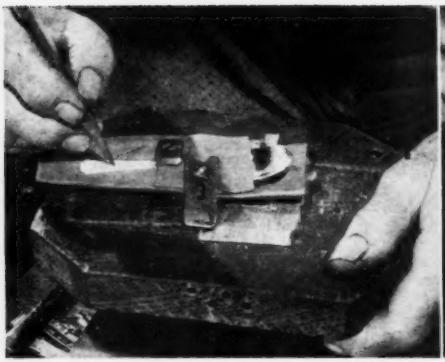
TOOLS NEEDED TO GET STARTED. Work is clamped to pivoting table that turns on ball bearing held by bolt. Phono needle (insert) is ground and honed to polished chisel edge.

draw the ruled guide lines (which are later washed away with the whitener), since a hard spot in a graphite pencil might scratch the work. A compass, screwdriver and a 6" flexible rule just about complete the list of tools needed.

Practice on scraps of soft metal, such as brass or aluminum, and then make up simple name plates for toolboxes and start engraving your less expensive tools. You'll soon get the hang of it and feel your control of the cutting tool grow. Develop a rolling or twisting motion of the wrist to "walk" the tool through the metal. Each twist of the wrist causes the tool to take a little bite and move ahead a trifle, so keep the tool walking and turn the pivoting table to follow the outline of the letters. Start with simple block letters, saving the script and Old English till you can tackle them with confidence. Complete alphabets, in many letter styles, can be traced from books found in the pub-

SHOE WHITENER, mixed with small amount of mucilage for adhesion, is applied to work for layout. This is washed off after cutting.

TWIST THE WRIST, rolling it back and forth, to "walk" tool through metal. Tool follows letters penciled in on shoe whitener.



FELT PADDING is used over and under fine work to protect it. With practice you'll be able to place and size letters attractively.

DRUM JIG, wrapped with felt, holds band from a trophy. Small table between the knees positions work nicely.

lic library. Designs for ornamental borders that will neatly frame and set off a well executed monogram can also be found in books dealing with various styles of printer's type.

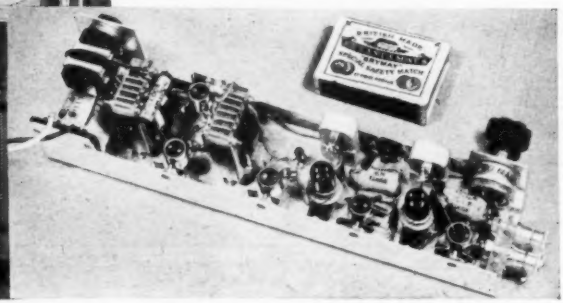
Jewelry, compacts, lighters and a host of other such items are welcome recipients of your newly acquired skill. Check the layout carefully; you can't erase a misspelled name or a wrong initial. Avoid cheap jewelry or compacts with a lacquered finish over light plating. Such items cannot be engraved without cracking off the surface finish.

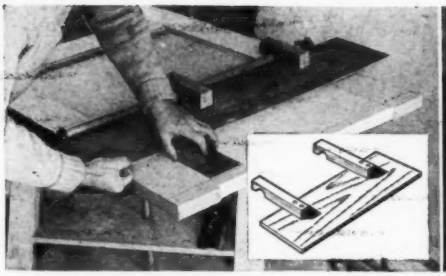
It's profitable, too. Trophy lettering can be a profitable sideline, or a way to save dollars for your golf or bowling club. Pedestal trophies are usually made with a band of metal that can be readily removed and mounted on a drum jig for engraving. A little extra care is needed when cutting these bands as the needle slips more easily on a curved surface. END

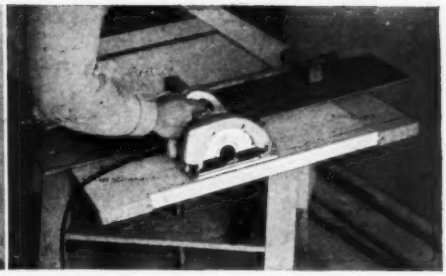
British Radio Exhibit Shows One-Inch Television Tube

A TINY television set and a midget tubeless radio shared the spotlight with large-screen TV at a recent radio and television exhibition in London. The 1″-screen televiser (left), said to be a working model, is shown with a 21″ console, largest direct-view set on display. The tiny receiver is not made commercially.

The small radio below works like an ordinary five-tube set—but it has no tubes. The British General Electric Co. built the experimental receiver around five germanium-crystal triodes, recently developed substitutes for vacuum tubes.





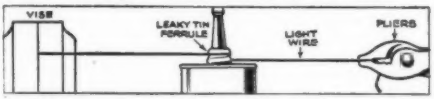


Guide on Pipe Clamp Aids in Trimming Doors

WITH this guide and a portable saw, you can quickly whack the excess length off a new door and get a straight, clean cut.

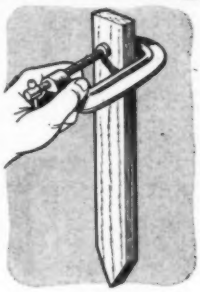
The guide consists of a squared plywood panel carrying two wooden blocks that drop over a pipe clamp. Make the blocks by boring a hole the diameter of the pipe in a piece of stock, splitting it down the middle and screwing the two pieces to the plywood. To use, set the clamp so the saw, its side pressed against the plywood, cuts along trim line.—*W. G. Waggoner, Sacramento.*

Vise Helps Seal Leaky Oilcan



LIGHTER-FLUID or machine-oil cans that leak at the ferrule can be tightened as shown above. Wrap the shank of the cap with one or two turns of light-gauge wire. Anchor one end of the wire in a vise and pull the opposite end tight, rolling the can one or two turns to get a tight fit.—*J. C. Heasley, Corpus Christi.*

Clamp Holds Stakes for Driving



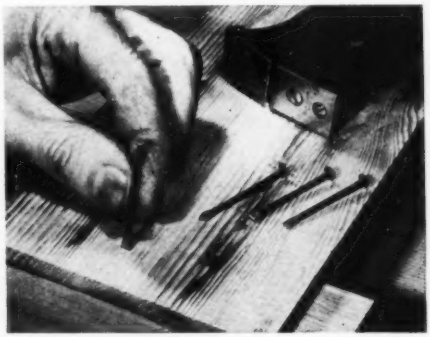
WHEN driving a series of stakes along a straight line, they tend to twist under the blows. A large C clamp used as a handhold makes it easier to grip them and keep them in the correct alignment.—*C. A. Wyneken, Van Nuys, Calif.*

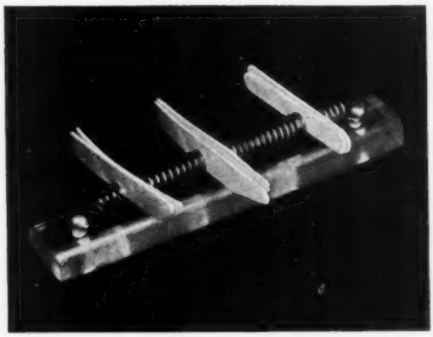
Chisel Nails Don't Split Wood

ORDINARY nails push the fibers aside when driven into wood, often splitting it. For wood that splits easily, I hammer the nail tips flat and snip off some of the flattened portion. The resulting chisel-like end, held crosswise to the grain, cuts a path when driven.—*Walter E. Burton, Akron.*

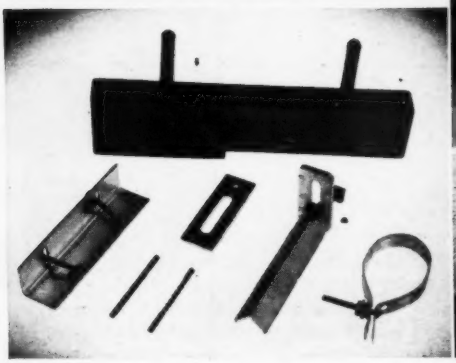
Rack Holds Collar Stays

IF YOU have ever searched frantically for plastic shirt-collar stays when dressing in a hurry, you'll appreciate the holder shown below. The base is a 4″ by ¾″ by ⅜″ Lucite bar with the top edges beveled. The small spring coil is attached with machine screws. —*John J. Rea, Urbana, Ill.*

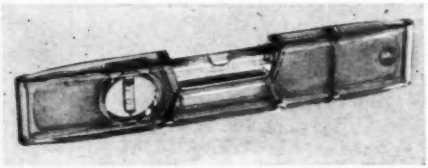




New Tools



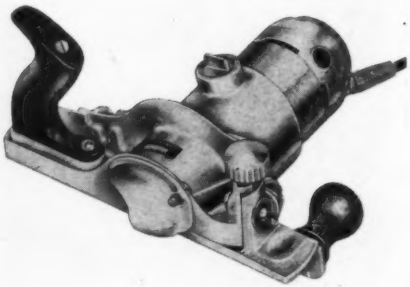
Drill Powers Planing Attachment. The parts shown in the photo at left above can be assembled to make the planing attachment for a ¼" electric drill as shown at right above. The two ¼" cutters—one for rough planing and the other for smooth—have a 2" cutting surface. You can also rip boards up to 2" in thickness with the attachment. *International Twist Drill Corp., Kansas City, Mo.*

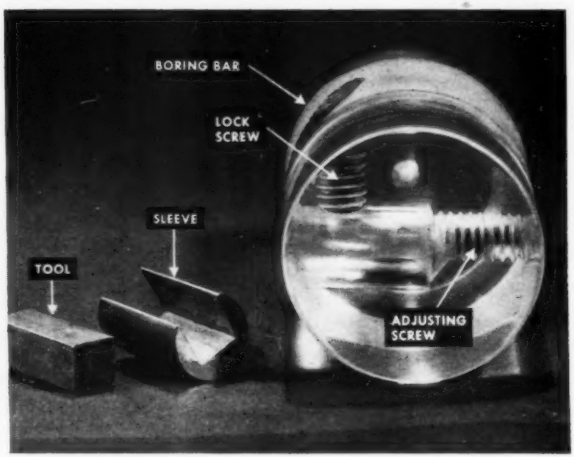


Plastic Level. You can't break the bubble glass of this level, says the maker—it is embedded in solid Lucite. The frame of the level is another plastic, Tenite. Since the plastics are insulators, the tool is safe to use around electrical wiring. *Creative Plastics Corp., Stony Brook, N. Y.*

New Expansive Bit. The feature of this bit (below) is the one-piece shank, making adjustments easier. It will cut holes from ½" to 3" in diameter. *Robert H. Clark Co., Beverly Hills, Calif.*

Electric Tool Planes, Routs. This electric plane—a kit converts it to a router—cuts up to 1 13/16" wide and bevels both ways. The ⅜-hp. motor turns at 18,000 r.p.m., and has a motor ventilating system that also clears the chips away, blowing them down and to the rear, away from the cutter and operator. *Stanley Electric Tools, New Britain, Conn.*



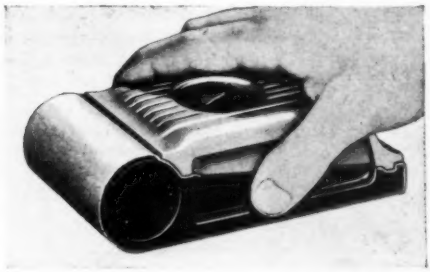


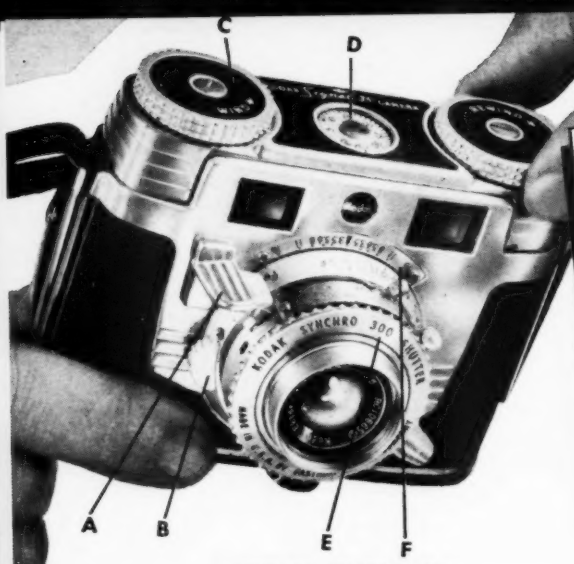
Square Tool Fits Round Hole. Tools can quickly be fitted in a boring bar with a round, slotted sleeve. A hole is reamed in the boring bar (modeled in plastic at left) for the depth of the tool. The sleeve is inserted and excess length cut off. Two holes for setscrews are drilled and tapped in the bar. One screw holds the tool, and the other adjusts it. The sleeve can be held by drilling a hole and using a pin, or it can be soft-soldered or brazed in place. Sleeves are made in nine sizes. *Formed Tools Co., Novi, Mich.*

Production-Type Drills for Home Use. High-speed drills like these, usually found only in industrial plants, now are available at hardware stores. The doubled-edged points (inset), known in the aircraft industry as split points, have four cutting edges instead of the usual two, reducing friction and penetrating faster. The points are self-centering and no punch is needed for starting. They are available in sizes from 17/64″ to ½″ with ¼″ shanks. *Century Drill and Tool Works, Chicago.*

Saw Set for Circular Saws. Blades from 6″ to 10″ in diameter can be set with this tool (below). The tool-steel anvil is milled to give a set of 10° or more. The farther out over the anvil you move the teeth, the more the set will be. After the blade is adjusted for the amount of set you want, a hammer tap on the setting stake does the job. *A. D. McBurney, Los Angeles.*

Sander Uses Standard-Size Paper. A standard-size sheet of sandpaper can be cut into three strips which fit the plastic hand sander below without waste. No special refills are needed. *Burgess Vibrocrafters, Chicago.*





EASY-TO-USE CONTROLS

A Feather-touch shutter release bar

B Finger-tip control for superimposed-image range finder

C Winding knob has interlocks for double-exposure prevention and film stop

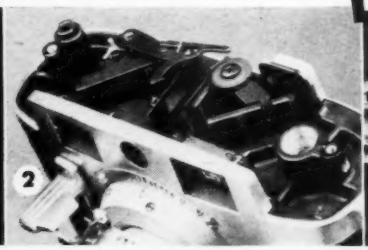
D Easy-to-read exposure counter

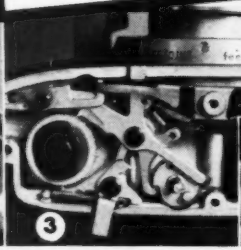
E Shutter with speeds up to 1/300, built-in "flash"

F All lens-and-shutter settings visible from above

Kodak's newest color miniature with world-famous EKTAR LENS

Here's a gem of a range-finder "miniature" that boasts a Kodak Ektar Lens (f/3.5 Lumenized)—famed as the finest in countless photographic fields—unsurpassed for producing sharp, brilliant color slides for projection or full-color prints. Be sure to see the Kodak Signet Camera at your dealer's—only $92.50.

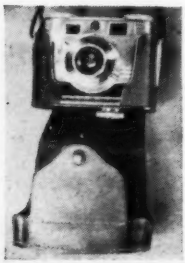




1. Shutter mechanism is sturdily built for lasting reliability. Accurate flash timing for the popular No. 5 and 25 lamps at all speeds—1/25 to 1/300. "B" setting for time exposures. Sturdy, 2-blade design is exceptionally efficient.

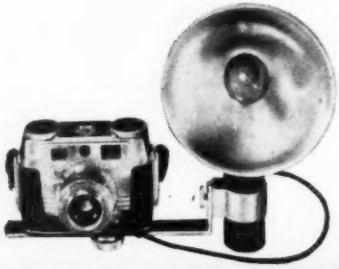
2. Superimposed-image range-finder mechanism is rugged, with all parts generously dimensioned. Spring-loaded, V-block bearings eliminate the small bearing variations that cause serious range-finder errors. Range finder is combined with view finder for rapid focusing and framing through a single window.

3. Film-advance mechanism is smooth and jam-proof. Film can be advanced with a flick of the thumb (see inset). Exposure count and double-exposure prevention are automatic, but deliberate double exposures can be made at the touch of a lever.



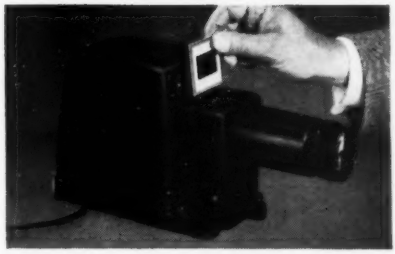
For protection and convenience—Handsome, tan leather field case with neck strap. $8.50.

For brilliant indoor shots—the Kodak Flasholder, Model B, is quickly attached for synchronized flash pictures. $10.55.



The "payoff" in color photography is a BRILLIANT SHOW

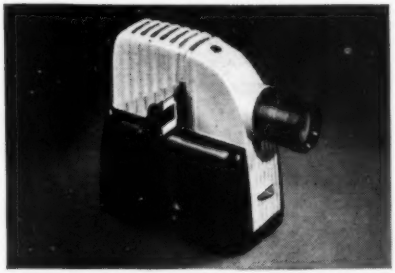
On your screen . . . on your viewer . . . it's the show that counts. 2x2-inch slides of travels, home scenes, lecture subjects sparkle with new brilliance in living room or auditorium when shown with the right equipment. On this page you'll find a selection from which to choose. Ask your Kodak dealer for a demonstration. He'll be glad to help you.



Kodaslide Merit Projector—Features improved slide-feeding mechanism—you feed slides in *top* of projector, minimizing jarring of instrument. Includes Kodak Projection Ektanon Lens, 5-inch f/3.5. $26.10.

Kodaslide Projector, Model 2A—Ideal for small shows. Heat-absorbing glass protects slides. Powerful lamp projects images up to 7 feet wide. With Kodak Projection Ektanon Lens, 5-inch f/3.5, $52.80.

Kodaslide Table Viewer, Model A—Projector, screen, and slide changer in a single unit. Projects brilliant images even in a lighted room. Takes 75 cardboard or 30 glass slides. $97.50.



Kodaslide Projector, Master Model—For large-group showings. Fast lenses and 1000-watt lamp can deliver more light to screen than any other 2x2-inch slide projector. Turbine-type fan cools both sides of slide. Choice of four projection lenses. From $169.

Kodaslide Table Viewer, 4X—This new low-priced viewer enlarges slides more than four times on its built-in screen. Ideal for effortless showings to small groups. $49.50.

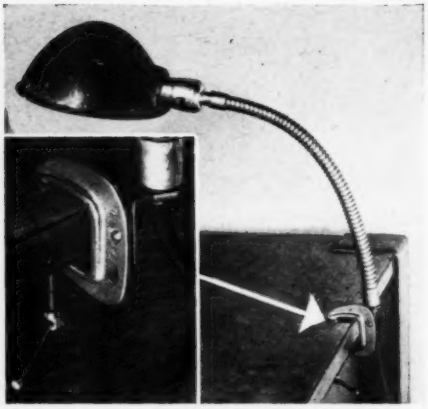
FOR A SURPRISE SHOW—

Treat your audience to professionally prepared color slides, too. Many interesting subjects at nominal cost. Ask your Kodak dealer.

Prices are subject to change without notice and include Federal Tax where applicable

Kodak

EASTMAN KODAK COMPANY, ROCHESTER 4, N. Y.

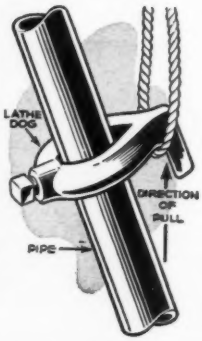


Clamp-On Lamp Lights Any Spot

A DISCARDED gooseneck lamp makes a useful shop light when fastened to a C clamp. Remove the lamp base and replace it with a small angle bracket. Drill a hole in the clamp and bolt it to the bracket as shown.—*John J. Rea, Urbana, Ill.*

Lathe Dog Helps Handle Pipe

A LATHE dog is a convenient handle for pulling a piece of pipe from the bottom of a stack. It also provides an eye for threading a rope to lift the pipe. If pressure is applied as illustrated, the set-screw on the dog need be only finger tight to hold the pipe.—*Hugh Lineback, Stillwater, Okla.*



Two Nails Stronger Than One

FOR supporting heavy loads, use two nails, one serving as a diagonal brace for the other. Drive in the first nail at an angle until half of it is embedded in the wood. Place the second nail in an almost horizontal position above it, driving it in until it rests on the lower one. If the top edge of the lower nail head is flattened, alignment is easier. —*Walter E. Burton, Akron.*

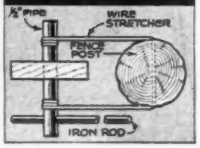
Plaster Mixer Rolls to the Job

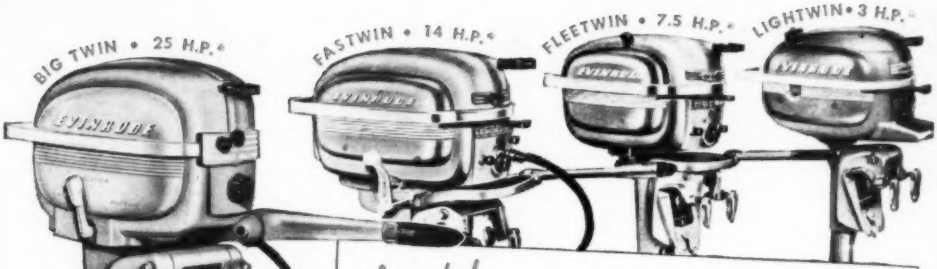
THIS homemade plaster mixer, mounted on what was once the front axle of a car, is easily hauled from job to job. Revolving paddles inside the oil drum mix plaster faster than three men can put it on the walls. A ½-hp. electric motor powers an old car transmission through a 1-to-8 V-belt drive. The drum is mounted on the output shaft of the transmission.

Wire Stretcher Built into Fence

WITH an arrangement like this, you can take up slack in a wire fence the same way a musician tightens a violin string.

First fasten the wires to a strong hardwood board through which a hole is bored to take a piece of ½" pipe 4" long. String a length of heavy wire through the fence post and through holes in the pipe where it emerges on either side of the board. Wrap the ends of the wire around the pipe. Pass an iron rod through a larger hole drilled near one end of the pipe. A turn of the rod takes up any slack in the fence. It is best to have a second wire stretcher near the bottom of the post.—*C. A. Veberg, Omaha.*





Yes sir! THEY'RE AMERICA'S

Foremost Four

FOR BOATING FUN!

They're a bit out of this world, in the big-and-little things you like in your outboard motor! They're wonderfully smooth, sharp-starting, easy to handle. They love a wide-open throttle . . . they're equally ready to chuckle along at lazy trolling gait . . . even the top-powered Big Twin is a slow and steady troller! Their stamina is almost limitless, as is daily demonstrated by countless thousands of them in rugged commercial service. *Choose your size* . . . Big Twin or Fastwin with Gearshift and Cruis-a-Day Tank. Fleetwin with Duo-Clutch—the sparkling "all-arounder" for fishing and family service. Or Lightwin—*newest on the water*—3 hard-thrusting horsepower—Fisherman Drive—and weighs only 30 lbs.!

SEE YOUR EVINRUDE DEALER—look for his name under Outboard Motors in the yellow pages of your phone book. *Catalog Free!* Write for full-color catalog of the complete Evinrude line. EVINRUDE MOTORS, 4745 N. 27th Street, Milwaukee 16, Wis.

In Canada: Evinrude Motors, Peterborough, Ont.

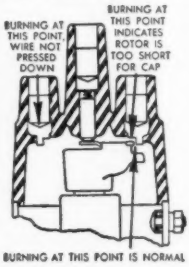
*Power ratings are O.R.C. certified brake H.P. at 4000 R.P.M. Weights, materials and construction subject to change without obligation.

Care and Feeding of Engines

BY S. P. CORP

COLD-WEATHER STARTING

One cause of hard starting in cold weather can be ignition trouble. One cause of ignition trouble can be high resistance in the heavy wire to each spark plug, or from coil tower to distributor cap. A leak or dirty connection can cause a lot of trouble. *First: Stop engine.* Grasp each wire near top of distributor cap and try to force it down. You may feel it slide into place. Out of place, it could have caused hard starting. *Next:* Pull out one wire at a time and see that clip is clean. Look into wire tower with a flashlight; if dirty, clean with abrasive paper on end of a pencil. Replace wire, making sure it is down in the cap. Do this with each wire, even the coil wire. Clean top of distributor with carbon-tetrachloride.



STOP-LIGHT SWITCH

Your stop-light switch can run your battery down. This small hydraulic switch on the brake line is closed by pressure when brakes are applied. Dirt and dust with oil vapor will at times cause a current flow when switch is open. Make sure connections are clean and tight.

When replacing this switch, have the new one ready to install at once, in order to avoid losing brake fluid. Have someone depress brake pedal slightly, to fill fitting as old switch is removed. Install new switch quickly and tightly. Then replace wires. If brakes are then spongy, bleed air from brake line.

IF YOUR CAR SMOKES TOO MUCH

An engine that uses too much oil needs new Sealed Power piston rings. The Sealed Power MD-50 Steel Oil Ring does the world's best job of oil control, even in badly tapered and out-of-round bores. Your dealer has Sealed Power Rings or can get them for you. They save gas, save oil, restore original power to your engine and lengthen its life. A postal to "Sealed Power, Dept. H-2, Muskegon, Michigan," will bring you free a helpful book, "More Power, Less Gas, Less Oil!"

How Flying Cameramen Get Pictures

[Continued from page 223]

was fast enough and an exceptionally steady ship. It was the kind of a ship in which you could take off your parachute right after you took off the door and then toss them both in a corner. Then, unhampered, you could walk right into the doorway and take movies or color or black-and-white.

This day Lew didn't know his pilot, but he understood he had quite an impressive record and lots of hours. He flew a nice steady ship so Lew's assignment was soon finished. As he snapped the last picture Lew said casually, "Let's get back to the field." The pilot evidently had a date, for the ship flipped over in a 180° turn and the parachute pack, the door and Lew moved for the open doorway in a blanket start. Lew grabbed a brace and the door wedged in back of him, but the parachute made it. Lew found himself, feet dangling in the air, watching the parachute disappear thousands of feet below.

Planes Aren't Built for Photographers

It is a little unusual to take off the parachute. It can't be done in most military airplanes—there's just no place to put it. You sit on it and the straps go around your thighs and over your shoulders. But it's not unusual to loosen the seat straps for greater freedom while taking pictures.

Art Pabst is no small man, and in a flying suit he gets no smaller. "When you see the cockpit of a jet you doubt a shoehorn will ease you into it," he says. "Between your knees is the control stick and you have been warned, 'Mustn't touch.' You loosen the seat straps, lift a camera and twist around at a simulated back shot and the pilot yells. You knocked his stick and if you had been in the air instead of on the nice solid runway, you'd have been in a beautiful dive. So you tighten your straps and tell your pilot you'll behave. He starts his fires and in seconds you are in the midst of a jerking, straining, surging roar that means the engines are being checked with the wheel brakes on. The ship steadies as the roar slackens and you hear the clearance come over the intercom.

"Then you are in motion—roaring. But in slow-motion at first for this is like fluid drive. Suddenly, airborne, the blast slips away from you, you ride on velvet and if you glance out the canopy the hangars are slipping by so fast they look like a blurred

[Continued on page 248]

1 SEEDBED PREPARATION—Without Change of Attachment!
No more changing from plow to disc to harrow as with ordinary "garden tractors"! Much easier — much quicker — much less expensive!

2 CULTIVATING—With Far Less Damage to Plant Roots!
Think what this means for raspberries, grapes, corn and all your other crops which have lots of tender surface roots!

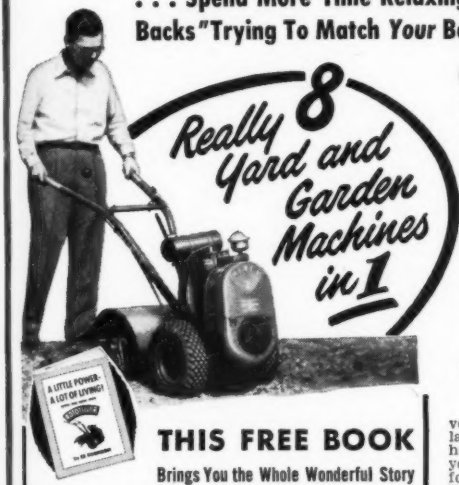
3 POWER COMPOSTING —For Miracles of Soil Improvement!
No more hauling, turning, watering of messy compost piles! No more need to buy expensive, hard-to-get manures!

4 WHAT A LAWN MOWER!
Cuts velvet-smooth 25" swath! Has no casters or over-hanging wheels — leaves no untrimmed edges! Follows contour of ground perfectly!

5 AS POWER SCYTHE IT'S A DOWNRIGHT JOY!
Tall weeds, hay, brush, heavy grass melt away in front of your ROTOTILLER — without clogging! Cuts 30" wide!

New Low-Cost Wonder Does Your Toughest Yard & Garden Jobs

. . . Spend More Time Relaxing While Others "Break Their Backs" Trying To Match *Your* Beautiful Garden and Grounds



CAN you imagine employing a skilled gardener who would work for less than a dollar a day? And can you further imagine that this gardener could do the work of eight men, *all at the same time?*

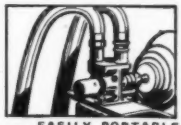
That's the kind of "gardener" you get when you own this amazing New Lightning-Change 1952 ROTOTILLER! Here is an easy-to-operate, low-cost, yard-and-garden machine that makes it fun for anyone to maintain beautiful lawns and gardens without outside help. Here, in but ONE machine, with simple, lightning-change attachments, is your answer to leisurely country living!

Grow All the Fresh Vegetables, Berries, Fruits You Want Without Outside Help

Now you can have acres of crisp, fresh vegetables, berries, fruits—lovely broad lawns — all kinds of flowers — without having to hire a single gardener! Now you can really ENJOY country living—for the New 1952 Lightning-Change ROTOTILLER can do a day's back-breaking chores in a single hour!

And what more versatile mechanical gardener can you find anywhere? Just see (pictured here) the 8 different jobs it does so quickly, so perfectly—everything from cultivating to wood-sawing. Even if you've never before thought about getting a "garden tractor," you owe it to yourself to find out about this amazing, new LOW-COST Wonder!

6 SNOW PLOWING — GRADING, LIGHT BULLDOZING!
Wonderful for cleaning walks and roads of snow. Perfect for grading new lawns. Can be put on or taken off in 30 seconds.



7 EASILY PORTABLE POWER — For Dozens of Other Jobs!
A year-around power source for water pumps, electric generators, insecticide and paint sprayers, trailers, grain grinders, etc. Any of these labor savers can be hitched in a jiffy.

8 CUTS FIREPLACE AND STOVE WOOD LIKE BUTTER!
In a couple of hours you can cut enough wood for a month. Pays for itself over and over again if you have a wood lot.

THIS FREE BOOK

Brings You the Whole Wonderful Story

THIS big FREE 68-page book, "A Little Power —A Lot of Living," was written for you by Ed Robinson, author of the famous "Have-More" Plan. Ed is an enthusiastic ROTOTILLER owner.

Packing his 68-page book full of scores of interesting photographs, Ed shows just how his ROTOTILLER improves the soil, eliminates weeds, composts by machine, cultivates garden, berries, fruit—and does dozens of other outside jobs. Also included are the actual, low-cost delivered prices, and the name of your nearest ROTOTILLER Dealer, in case you'd like a demonstration. No obligation whatsoever. Simply mail coupon at right.

THE NEW 1952

Lightning Change

ROTOTILLER

Reg. U.S. Pat. Off.

DOES A WHOLE DAY'S CHORES IN AN HOUR!

MAIL COUPON FOR FREE BOOK

Rototiller, Inc.
Dept. 302, Troy, New York

Please send me FREE, by return mail, a copy of your Big 68-page Illustrated BOOK, "A LITTLE POWER—A LOT OF LIVING," by Ed Robinson, author of the famous "Have-More" Plan.

Name_____

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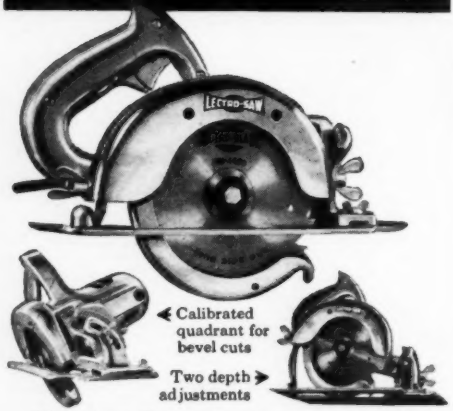
City_____ County_____ State_____

Feature for feature . . .

YOU CAN'T BEAT LECTRO-SAWS!



Abundant Power! Powerful motors built by Black & Decker specifically for tough power sawing.

Fast Adjustment! Easily adjusts for bevels from 0° to 45°; read on calibrated quadrant. Two depth adjustments—front and rear—always keep handle at comfortable wrist position.

Easy Handling! Sure-grip handle minimum distance from blade for easy control; close to center of gravity for good balance.

Maximum Safety! Telescoping blade guard automatically covers blade except when sawing. Instant-release trigger switch.

Low Prices! 6" Heavy-Duty Deluxe (shown), $76.50; 6" Heavy-Duty, $56.50; 8" Heavy-Duty, $92.50. Pay for themselves in time saved in a very few jobs! Try them at your hardware, appliance, building supply, implement or department store!

BLACK & DECKER

ELECTRIC LECTRO-SAW SAWS

The Black & Decker Mfg. Co., Dept. H2S, Towson 4, Md.

How Flying Cameramen Get Pictures

[*Continued from page 246*]

picket fence. Upstairs, where you have nothing to compare with your own speed, you seem to be gliding, for sound, other than the swish of the wind, is absent."

But these photographers are not thrill-happy extroverts. A serious bunch, they are currently engaged in a struggle to have their work recognized as a direct contribution to engineering science. Few have that recognition now in spite of their claim that 80 percent of engineering flight questions are answered by photography. Too often, they say, their suggestions are brushed aside with "he's just a photographer."

Photographers Are Engineers, Too

Photographers who specialize in medical subjects and in industrial research get the same brush-off. So some of them are forming a chapter in the Society of Photographic Engineers. One goal is to get leading universities to set up special courses on industrial photography entirely separate from current courses that emphasize merely art.

Roy Wolford, one of the leading figures in this movement, points out that many of the best plant photographers have either engineering education or shop experience in addition to photographic skills. Aerial photography grew up along with the industry and both the airplane and the photographer are more efficient today.

Wolford is glad that they are, too. Some years ago his insurance company got the peculiar notion his work was dangerous and wanted higher premiums. A short time later Roy drew an assignment to photograph test runs of the new Flying Wing bomber and found himself aloft in a fighter plane with an escort ship flying herd on them.

Escort Spots Fire

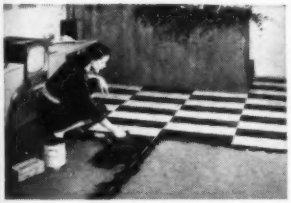
Most of the pictures had been taken when the escort pilot shouted: "You're on fire."

"Fuel was pouring from a broken line over that engine like it was coming from a bucket," says Roy. "The prop wouldn't feather and the extinguisher had no effect. As I watched, the flame ate into the metal like an acetylene torch.

"I didn't need an order to jump. The engineer unloaded and I started to loosen my canopy when I realized that the pilot was struggling. The crazy son of a gun with never the necessity for a jump in 20 years

[*Continued on page 250*]

STEP 1... Mrs. Lansing follows the simple instructions. Here she's beginning to spread adhesive over half the play room.



STEP 2... She puts tiles down in place, one at a time. When half the floor is covered, the adhesive is spread over the remaining half.

STEP 3... After adhesive is ready, Mrs. Lansing continues installing tiles ...and the other half of the room is finished...and all ready to walk on.

Mrs. Richard Lansing shows how to install a KENTILE FLOOR like this for only $22.25* FOR 9'x16'6" FLOOR

Think of the money you'll save! 26 glorious colors to choose from give you colorful beauty for kitchen, bedroom, living room...anywhere in your house. Cleaning is easy with Kentile...it sheds dirt and stains...gleams like new with occasional no-rub waxings...stays bright and fresh even with the hardest kind of service.

So why buy floor-coverings with just a colored surface that wears off with use? For so little more you can now get wear-resistant Kentile with colors extending right through each tile—and with quality assured by this guarantee.

Only Kentile dealers offer you these low-priced Guaranteed Kentile Floors

*Price quoted is for a 9'x16'6" Kentile floor (less stair area) installed by you. Your Kentile Floor may cost less or slightly more, depending on size of room, colors and freight rates. See your local Kentile dealer. He's listed in the classified phone directory under FLOORS. In Canada, T. Eaton Co., Ltd.

KENTILE, INC., 58 2nd Ave., Dept. H-5, B'klyn 15, N. Y.

KENTILE®

The Asphalt Tile of Enduring Beauty

KENTILE GUARANTEE
FOR SELF-INSTALLED KENTILE

Kentile, Inc. will provide new tile without charge for any Kentile that wears out . . . and on which colors wear off . . . during your own occupancy of your home wherein you have installed Kentile. This guarantee does not apply to damage caused by improper handling, or failure to follow the instructions for installation and maintenance available at your Kentile dealer's.

How Flying Cameramen Get Pictures

[Continued from page 248]

had been flying with his 'chute straps off and now was trying to get them back on.

"It was lucky we had 13,000 feet, for that ship played dipsie-doodle all over the sky while I helped him strap up. Then his canopy stuck and I didn't dare open mine for fear his would let go just as I stuck my neck out. At the last minute, his skylight shattered and he jumped as the ship started a dive. I clambered out on the left wing, but some kind of turbulence held me there, slugging and pounding me.

"I finally rolled off spinning and luckily missed the stabilizer. If you straighten out stiff as a board you come out of a spin, and as soon as I got a reasonably level horizon I pulled the cord. No matter how often you jump it's a comforting noise when that big umbrella snaps open above you. I tucked the ring and cord into my shirt—they nick you seven to 12 dollars if you lose them—when I noticed my shirt front was covered with blood.

"I felt my nose and it wasn't the one I'd started with. About then a gas tank blew and what was left of the ship looked like an oil-soaked rag. When it hit the ground it exploded again. I got down all right if you don't count the power line I missed by 50 feet and the ditch I didn't miss. Neither the pilot nor the engineer had ever jumped before and they got down fine and me, the old hand, got a broken nose, a pair of black eyes and a mighty sore fanny from the operation.

How Safe Can You Get?

"We rushed the mile to where the plane was burning and you'd wonder where in all that desert country so many people would come from. But everything seemed under control for an ex-GI had taken over. 'It's all right, boss,' he assured us, 'I roped off the whole area.'

"He had, too. He'd pried open the couple of cans of exposed film that had been tossed free and used it for rope."

Wolford says such things are the exceptions that prove his job is safe, and he even convinced his insurance company. But he waited until the color had gone from his eyes and his nose got down to normal. END

Sturdy, Substantial ALL METAL! PRECISION GROUND & POLISHED TABLE

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8-inch ALL METAL TILT-ARBOR POWER SAW

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8-inch Combination Rip and Cross Cut Blade.....$2.95

BLADE TILTS TO 45° ANGLE! TABLE STAYS LEVEL!

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Address .....

City ..... Zone ..... State .....

☐ If 8" combination Rip and Cross Blade is desired, enclose $2.95 extra and ch. ☐ square at left.

CUTS 2" x 6s" in 2½ SECONDS!

You can mitre, bevel, or saw any length wood at any angle yet the table and work are always level. A simple adjustment of the patented, improved mechanism tilts the blade up to 45°. Patented built-in motor mount eliminates complicated gears, always keeps belt at correct tension. Has height lock for dadoing. Blade raises and lowers. Does everything a $60 saw will do! Cuts joists, siding, rafters, frames, joints, slots, etc. Accurately rips, wide or narrow panels! With attachments cuts dadoes and moldings! Mounts on any kind of tool bench!

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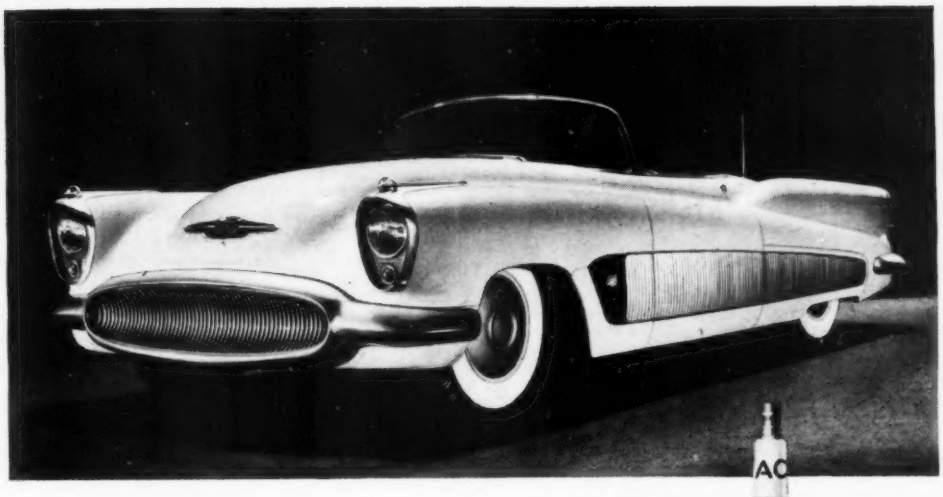

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BUICK xp-300

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AC scores another triumph, with the selection of AC Spark Plugs to fire the 300 horsepower supercharged engine of Buick's "Dream Car," XP-300.

With its higher speed and extra high compression—using premium fuel up to 125 H.P. and methanol above 125 H.P.—the XP-300 develops terrific combustion chamber heat. No spark plug insulator before *CORALOX* could withstand it.

***CORALOX*, AC's patented Insulator, is the greatest contribution to spark plug efficiency in 40 years. It provides greater resistance to heat shock—better insulating qualities—greater resistance to fouling.**

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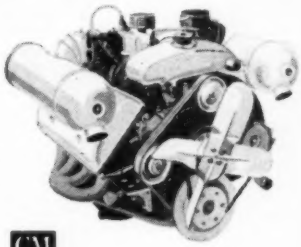
BUICK'S XP-300 experimental masterpiece, with a host of ultramodern features, including a 300 horsepower high-compression V-type engine, sets the pattern for advanced performance, greater comfort and conveniences you may enjoy in the future.



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HANDY WOODWORKING CALCULATOR...ONLY 25c
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CITY..... STATE.....

Gus Helps Tie a Knot

[*Continued from page 198*]

At that point, Gus decided to road-test the sedan. He had driven about 20 miles with the temperature gauge showing normal when he happened to look down at the dashboard clock. He suddenly realized that he'd already spent more than an hour and still hadn't a ghost of a clue to the trouble. He slowed the car to a stop, turned around on the narrow road, and headed back toward town. By the time he was halfway there, the engine gauge had climbed well up into the hot zone, and when he pulled up at the Model Garage the radiator was boiling.

"Temperamental youngster," Gus muttered to himself after he had parked the car inside. "Something must cut down the circulation every once in a while." He started the car up again, put more water in the radiator and began another systematic check.

Gus Beats the Deadline

Gus was standing at his bench wiping his hands on a piece of waste when the repair-shop door swung open. It was his helper, Stan Hicks, resplendent in blue suit, gray fedora and gray overcoat.

"I thought you were enjoying a day off," Gus said.

"I was, boss, until I went to Peggy Simpson's wedding and heard about her husband's car. Thought I'd come over and see if I could help."

"That was a nice idea, Stan. But I'm happy to report that she's all fixed and we've got just 15 minutes to get the car over to the Simpsons'. Hop in; I won't wait to change my clothes."

They found a place for Tom Thornton's car right at the Simpsons' driveway—a perfect spot for a quick getaway, thought Gus.

"Look, Stan, you take these keys in and give 'em to Tom. I'm not dressed up for a weddin' party. I'll go over and sit in my car and wait for you. I see it's parked just across the street."

Genius Is Suitably Rewarded

Sitting relaxed in the driver's seat of his own car, Gus didn't see the two figures slip out the side door of the Simpsons' house. He didn't even notice when, hand-in-hand, they tiptoed around the back of his car. So he was understandably startled when the car door was jerked open and Peggy Thornton (née Simpson) flung her arms around his neck

[*Continued on page 254*]

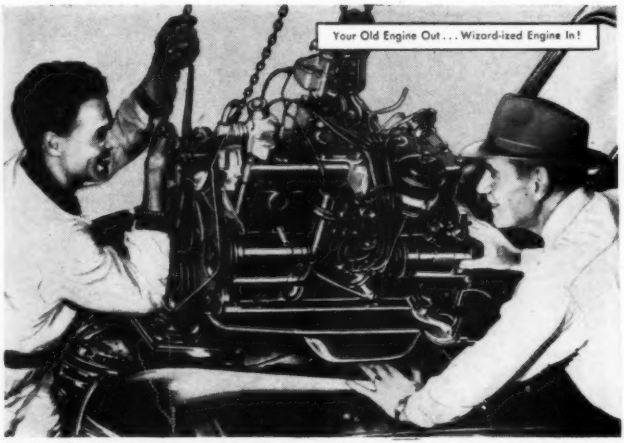
GOOD-BYE TO THIS COST!..GOOD-BYE TO THIS WORRY!..GOOD-BYE TO THIS DANGER!

1 **Paying Out $10 to $30 A Month** for "little" engine repairs? Burning up dollars – in gas and oil? Then you're *paying* for a WIZARD-IZED Engine. Why not get it?

2 **Afraid To Take Your Car** out for fear the engine will "conk out"? Better to put your money in a WIZARD-IZED Engine – than in costly towing and repair bills!

3 **Engine Too Sluggish And "Old"** to provide the power to pass other cars safely? The money you might pay for repairs could buy your WIZARD-IZED Engine!

Now You Can "NEW-ENGINE" Your Car For About The Price Of An Overhaul!



Instead of merely overhauling, "new-engine" your car this easy WIZARDIZED way — for about what you'd pay for an overhaul. Expert installation by trained mechanics in fully-equipped garages. And your old engine is worth a generous **guaranteed** trade-in allowance. See your Western Auto man —now!

And A Factory Remanufactured Wizard-ized Engine Has A New Engine Guarantee!

That's right! Why pay $150 to $180 for a bearing-ring-and-rebore overhaul, and have all the other "tired" old parts left in your engine?—when the same money can buy you a completely remanufactured Wizardized Engine? Why take 10,000 to 15,000 engine miles for your money—when you can get up to 50,000 miles or more.

Here's what we mean by remanufactured: It is **not** just your old engine, overhauled and put into your car! Your Wizardized Engine is precision remanufactured, using original factory block, in one of five large factories that handle no other work. Every part meets new-engine tolerances.

Every moving part is brand new or fully remanufactured to function like original equipment.

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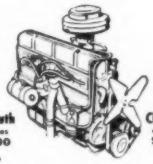
Plymouth as low as **$17.00** down



Chevrolet as low as **$14.00** down

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The Engine You Can Buy with New Car Confidence!

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B-178

Gus Helps Tie a Knot

[Continued from page 252]

and planted a very satisfactory kiss on the middle of his cheek.

"Mr. Wilson, you're a darling! You've made our wedding complete. Now we can leave on our honeymoon, just as we planned."

"Thanks a million, Mr. Wilson," Tom added fervently, poking his head inside the car.

"Okay, okay," said Gus, grinning from ear to ear. "Lots of luck to both of you. Now you two kids get back in there and give the folks the fun of peppering you with rice and confetti when you make your official exit."

Gus Makes a Confession

"All right, boss," said Stan as he and Gus headed down into town for a cup of coffee. "How'd you mastermind this one?"

"Frankly, Stan, I was stumped. Then I just happened to be staring down at the engine while it was running and I saw it."

"Saw what?"

"One of the water pumps. That car has a V engine with two water pumps, one for each bank of cylinders, and they're driven by the fan belt. I noticed that the pulley on one wasn't turning. The belt was just slipping over it, so I pulled the pump down. What do you think I found?"

"What?"

"A lock washer. It had gotten into the cooling system somehow and every once in a while it got jammed under the impeller wheel and stopped the pump. That cut down the water circulation. Then when the car was stopped, or perhaps when it hit a bump, the washer would get loose and the pump would run. So I removed the washer."

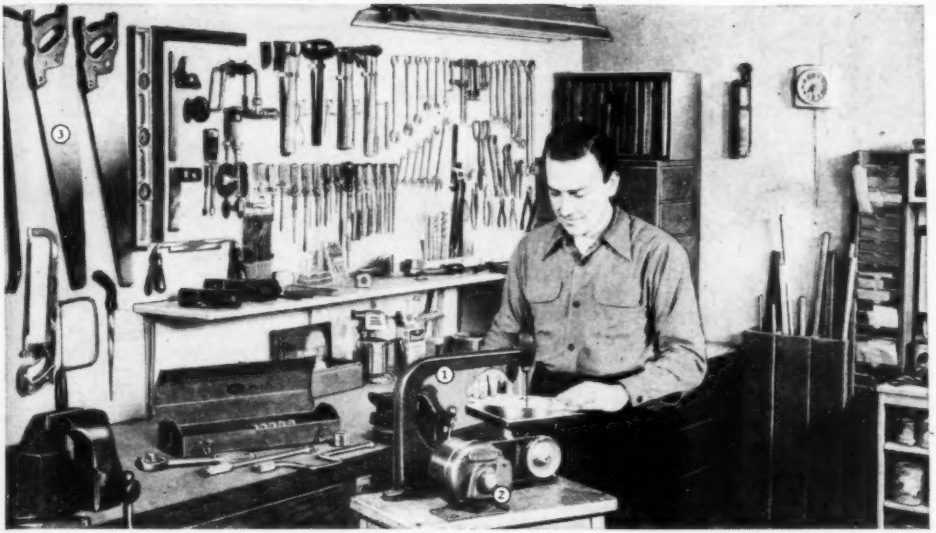
Sometimes It Pays to Be Lazy

Stan seemed to be thinking it over. "You know, boss," he said finally, "I don't think I'll ever be a good garageman. Just don't have the patience. Unless I'm tearing something down or putting it back together again, I don't feel like I'm doing anything. Take you, though. You can just sit back and watch and come up with the answer."

"Pure laziness," said Gus. "When you get to be my age you'll be content to let that noggin of yours do more of the work too. It's easier than barking up your knuckles with a spanner or a pair of pliers . . . Besides, you can *think* sittin' down." END

Next Month: Gus gets a high-pressure job.

With Prices Like These, No Wonder Thousands Choose Professional Quality Westcraft Tools:

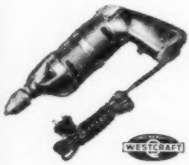


Before you buy any tools be sure to see, try and compare Westcraft. Like thousands of other tool buyers, you'll discover these famous, shop-tested tools give you the same precision engineering and lasting accuracy of other brands costing far more. Westcraft tools are fully guaranteed and are yours on easy terms. Here are a few from our complete selection—see them at Western Auto this week!

① **Tilt Table Jig Saw,** cuts to center of 24" circle. Scotch yoke, oilite bearings. Uses 5" pin or plain end blade. Yours now for only ------(2H1102) **$19.35**

② **¼ HP Electric Motor,** 1725 rpm, 115 volt, 60 cycle AC. Split phase. GE guaranteed for 1 yr. Use with jig saw, washer, paint sprayer, etc. (2H1600) **$17.25**

③ **8-Point Crosscut Saw.** 26", 4 gauge, double tapered blade. Precision tempered and polished. Comfortable hardwood grip. Yet only-------(4HR6329) **$4.89**



¼" Electric Drill, 115 volt, AC-DC, 60 cycle. Drills metal, wood, plastic. Guaranteed 1 yr.----(2H1379) **$11.95**

14-Piece Accessory Kit with attachments for sanding, polishing, grinding, etc. Steel tool box---(2H1378) **$4.75**

Hacksaw, chrome-plated adjustable steel frame. Cuts 3⅜" deep. Safety grip plastic handle. 10" blade (4HR4159) **$2.25**

11-Piece Socket Set, ¼" sq. drive. Alloy steel, chrome plated. For small nuts & bolts. Plastic box (HR2924) **$3.69**

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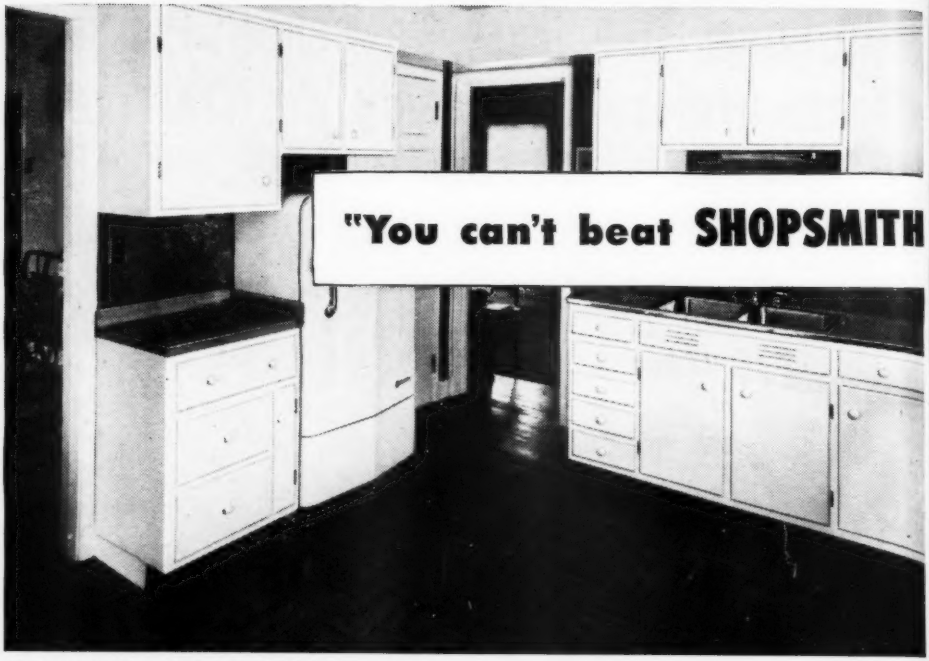
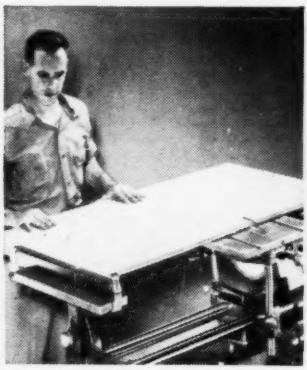
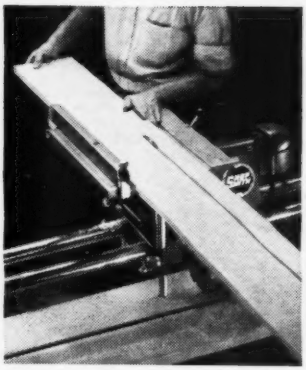


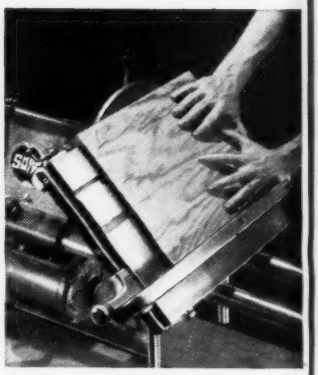
Kitchen designed and built by A. A. Myrus, Oneonta, N. Y.



1 **"FULL-SIZE PLYWOOD PANELS** are hard to handle on the average table saw. But not on SHOPSMITH. The SHOPSMITH table extension gives you plenty of working surface — *up to 48" between blade and fence.* Not many saws can match that!"



2 **"HAIRLINE CUTS.** Another thing I like about SHOPSMITH is its extremely accurate blade-to-fence setting. You make your fine adjustments by changing the position of the blade with the quill feed lever. It's faster and more accurate than shifting the fence."



3 **"BEAUTIFUL BEVEL.** Plywood is difficult to bevel with a plane or shaper. It chips and splinters. But I was able to get perfect results with SHOPSMITH set up as a disc sander and the table tilted 45°. Sander was also used to butt-sand drawer fronts and framing members."

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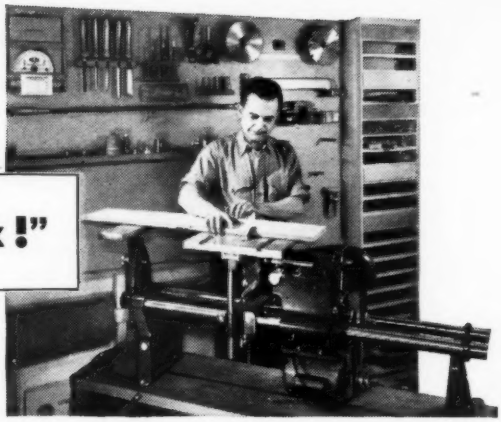
SHOPSMITH is a *complete* power workshop . . .
8" circular saw • 12" disc sander
33" wood lathe • 15" drill press
Horizontal drill

SHOPSMITH complete except for motor* . . . $189.50
*Special ½-hp., capacitor-type 120-volt, 60-cycle motor, $34.50



for cabinetwork!"

"I'm remodeling our entire kitchen. It's a big job. But, thanks to SHOPSMITH, I'm saving time and money and having the time of my life.

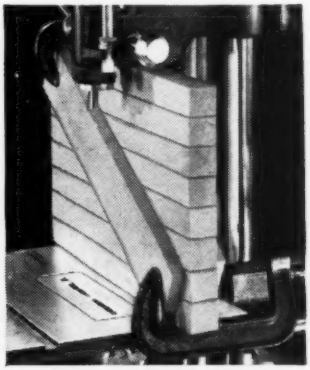
"Take the cabinetwork, for instance. There's where SHOPSMITH really showed me what it could do. I was able to cut 4′ x 8′ plywood panels easily and accurately. For 'right-on-the-button' saw blade to fence settings, I used the micro-quill adjustment—only SHOPSMITH has it. I beveled the edges of the cabinet doors with the disc sander. And I switched to the horizontal drill for doweling the maple chopping block.

"What especially impresses me is the accuracy of the work SHOPSMITH turns out. Every part fits perfectly. Corners are absolutely square. Dimensions check to the fraction of an inch. One reason for that is the fact that you can use the rip fence and miter gauge as jigs in almost every setup. Another reason is that SHOPSMITH is one integral unit. It can't get out of line.

"And when you add it all up—compactness, ruggedness, flexibility, extra features—it's easy to see why SHOPSMITH is America's most popular power tool."

4 "**KNOBS** for the drawers and cupboard doors were turned fifteen at a time with SHOPSMITH in the lathe position. The SHOPSMITH tool rest slides parallel to work making it faster and easier to turn long pieces. Speeds can be varied from 800 to 3600 rpm."

5 "**HORIZONTAL DRILLING** surely saves time and headaches. I used it to drill maple boards for a doweled chopping block. Table and rip fence served as jigs, made it easier to position holes accurately. The SHOPSMITH spindle floats on *four* ball bearings, has a 4″ quill feed."



6 "**GLUE PRESS.** There's almost no limit to the things you can do with SHOPSMITH. After the maple chopping block was glued, I clamped it to the tubular steel ways of the SHOPSMITH, let the weight of the headstock (about 100 pounds) act as a press until glue was set."

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He 'Invented' a Way to Make Money

[*Continued from page 145*]

Nor has he stopped inventing. Retirement has simply meant going right on with his pet developments, now at home instead of at the office. He still lives in Schenectady, but spends his summers on Brant Lake in upper New York, and when he leaves his city home, his workshop goes right along with him.

"We Need More Inventions"

"I can't be without my workshop," he says, "no matter where I happen to be. Suppose I should think of something!

"Invention has made this country great. We need more inventions—more worthwhile things to spend our money for. There are thousands of things which everyone needs right now, things which nobody has thought of. When someone invents them, employment and prosperity will increase. Many of us fail to realize that money is only a medium of exchange and the standard of living is controlled by the amount of goods available. You can't consume before you produce. You must make more goods for more people at less cost."

The value of a Suggestion Plan, Steenstrup contends, cannot be measured in terms of dollars paid out.

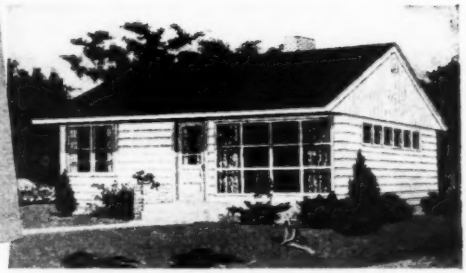
"It represents real human progress," he believes. "It discovers men. It reveals talents. It embodies the great democratic ideal of a chance for everybody. It benefits not only the company and the men and women involved but also the public and the world as a whole."

Suggestions Help Keep Country Safe

Suggestion Plan enthusiasts add that such systems improve employer-employee relations. They give workmen direct contact with the management and furnish official recognition as well as a sense of belonging and participation.

"Perhaps the most impressive thing of all," says the director of plant labor relations for another big electrical concern, "is the importance of many of these suggestions to the national preparedness program." By saving vital material and time, by bettering shipping dates, and by improving products and manufacturing operations, the participants in Suggestion Plans such as Steenstrup started are helping to defend the country that gave young toolmakers from overseas a chance to think and be paid for it. END

THIS ALADDIN 5-ROOM HOUSE $1974 FREIGHT PAID



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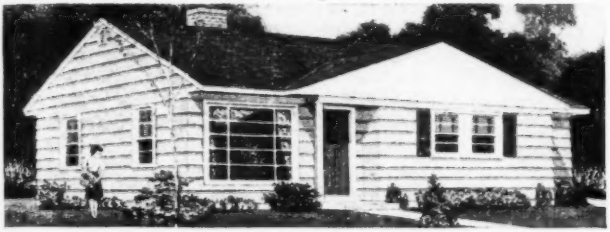

THIS IS THE WAY TO BEAT THE HIGH COST OF BUILDING!

BUILD YOUR OWN HOME Every hour you put in on the construction of your Aladdin house means a saving to you of from $2 to $3 per hour—$14 to $21 a day! Total carpenter work runs from 300 to 1200 hours, depending on the house you choose. WITH MOST OF THE SKILLED LABOR ALREADY PERFORMED at the Aladdin mills think how easy it should be for you to bring the cost of your home down to practically a pre-war level. Our drawings and instructions are simple to follow and cover everything from the foundation up so you can save any or ALL labor costs.

WHAT YOU GET WHEN YOU BUY AN ALADDIN HOUSE

- ALL THE LUMBER accurately cut to fit, marked and numbered ready to erect practically without use of a saw.
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- FLOORING
- DOORS
- HARDWARE
- PAINT
- TRIM
- MILLWORK
- MOULDINGS
- WINDOWS
- GLASS
- ROOFING
- NAILS
- COMPLETE DRAWINGS & INSTRUCTIONS

Hundreds of Aladdin home buyers have erected their own houses

IMMEDIATE DELIVERY

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152

THE LUFKIN RULE CO., SAGINAW, MICHIGAN
132-138 LaFayette St., New York City, Barrie, Ontario

Sharkfighters Use Spear Guns

[Continued from page 151]

was a mistake—the shark was still a lot too much fish.

Quote from Pallack: "I grabbed his dorsal . . . He thrashed around and threw me off . . . He lunged at me but hit the boat right beside me instead, chawing quite a hunk out of the bow . . . I got out of the water pretty fast."

(Well, some guys just can't take it!)

No more attempts to knife the shark were made—nor were they needed. After the three-hour running battle, the big fish was finally starting to go. The tireless engine began to win the tug of war and as the boat picked up headway the dying monster was towed back toward shore.

"Beached and deceased"—as the Key West *Citizen* succinctly put it—the hammerhead measured 13 feet seven inches long, 76 inches in girth. And his conquerors learned that their little seagoing playmate tipped the beam at 1,160 pounds!

Divers Discover Old Warship

Charlie, Wally and Ernie have shared a good many other marine adventures—such as their discovery, only a few weeks before the shark episode, of the hulk of a centuries-old Spanish warship off Key West. So far, the wreck has yielded nothing except coral-encrusted cannonballs and several old cannon. But who knows?—there may be bullion stashed away in the rotting hold. Meanwhile the treasure, if any, is well guarded by the stinging jellyfish that swarm about the ancient vessel.

To appreciate the sharkfighters' amazing nonchalance toward marine monsters whose very names have a nightmarish ring, you have to listen to them talk. Get a load of this: Almeida, in reply to a query on the temperament of the barracuda—"Barracuda? They're bums. The other day I speared a nice snapper and was dragging him toward the boat when a barracuda slid up around a jagged coral ledge and went for him—chopped him in two like a butcher's cleaver. That cussed 'cuda was too lazy to hunt his own dinner so he helped himself to mine."

Fish Like to Know What's Going On

Almeida and Pallack both have had experiences with what they call "fish curiosity." Almeida was swimming along, watching the coral bottom for fish when a young

[Continued on page 264]

A NEW THRILL for Home Builders . . .

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SAVE 2/3 THE COST

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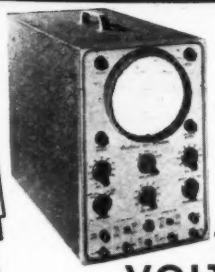


Heathkit 5" OSCILLOSCOPE KIT

A laboratory quality oscilloscope 5" cathode-ray tube — every part supplied including instructions for operation and assembly. Includes ten tubes — all controls — high gain .03 Volt RMS per inch vertical sensitivity useful to 5 Mc. An outstanding buy. Shipping weight, 29 lbs. — Model O-7

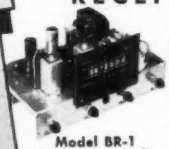
$43.50

Heathkit VACUUM TUBE VOLTMETER KIT

A complete electronic voltmeter in kit form. All parts supplied: cabinet, 200 microampere 4½" meter, tubes, test leads and instructions. Has 11 megohm DC input resistance. Measures full scale voltages AC and DC of 0 - 3 - 10 - - 30 - 100 - 300 - 1000 Volts and resistance between ½ ohm and one billion ohms. The outstanding VTVM available today. Shipping weight, 7 lbs. — Model V-5.

$24.50

Heathkit SUPERHETERODYNE RECEIVER KIT



Model BR-1
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A high quality AC operated superheterodyne receiver in kit form. Complete with five tubes — six inch slide rule dial — all coils — transformers and ready punched chassis and instructions. Learn about radio by building this outstanding receiver.

Heathkit 6 WATT ECONOMY AMPLIFIER KIT

Model A-4
Shipping Wt. 8 lbs.

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All metal parts ready punched. Only pliers, screwdriver and soldering iron needed for assembly.

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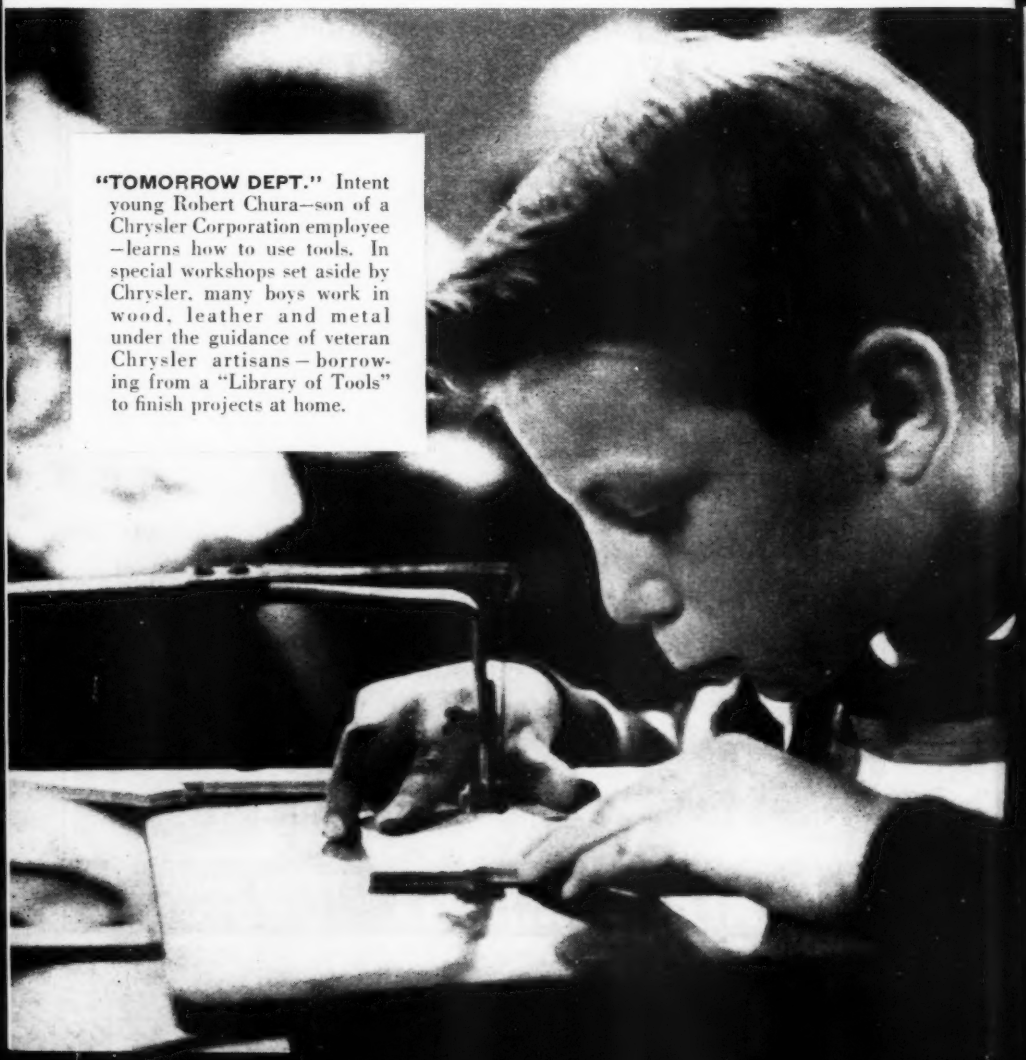
U.S. PRODUCTION DRIVE TURNS SPOTLIGHT

Chrysler Corporation's program helps people build better products and better careers for themselves

George Heyer, noted magazine photographer, turns his camera for this picture story on a program of importance to American production — how people learn to build new jet engines and military vehicles, and the cars and trucks that play a vital part in American life.

Heyer's pictures were made in Chrysler Corporation factories, classrooms and training shops. He shows a few of the thousands of men and boys now taking part in Chrysler's widespread training and technical education program.



"TOMORROW DEPT." Intent young Robert Chura—son of a Chrysler Corporation employee—learns how to use tools. In special workshops set aside by Chrysler, many boys work in wood, leather and metal under the guidance of veteran Chrysler artisans — borrowing from a "Library of Tools" to finish projects at home.

ON TRAINED MEN

CLASS IN JETS. These men are learning supervisory jobs for jet engine production at the Navy-owned Chrysler Jet Engine Plant in Detroit. Engineer J. E. Engstrom is teaching the latest in jet design. Like most Chrysler Corporation officials, these men came up from the ranks.

"GOOD MACHINES DESERVE GOOD MEN." Albert Bazner learns about grinders from machinist H. A. Nelson. Albert is a Chrysler Industrial Education apprentice, learning a trade—at good pay. In other courses, high school and college students earn both classroom credits and pay.

THEY THINK IN CLAY. At Chrysler Institute of Engineering, employee students D. M. Holiday, *left*, and Paul R. Diehl study body design with engineer Carl Hood. The Institute offers courses that compare with those in leading engineering colleges. At Chrysler, employees find training to improve themselves . . . become more valuable to America now when production need is great.

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Sharkfighters Use Spear Guns

[*Continued from page 260*]

mako headed straight for him. Almeida pointed his gun at the shark. The mako—about five feet long—swam up and grabbed the end of the spear. He held on for a few seconds and then turned and swam away.

Shark Gets a Jab in the Nose

In the same area—off Western Sambo—Pallack noticed a mako swimming alongside him. This went on for a few minutes, the mako lolligagging right along within easy reach. Then Wally jabbed the mako in the nose with his spear point. The mako decided he had business elsewhere.

The moray eel is a slimy, sharp-toothed, snakelike creature with an antisocial disposition. The dictionary describes the moray as "voracious" and "savage." Ryckman differs in his interpretation of its behavior—he goes along with Almeida and Pallack on the curiosity theory.

Ryckman on moray eels: "You know why they come nosing around? Because they want to know what's going on. Morays are just naturally inquisitive, that's all. Of course," with a small grin, "if they get too inquisitive, I shoot 'em."

Florida is not the only happy hunting ground for spear-fishing devotees—they're appearing in ever-increasing numbers along the California coast as well. If you're sound of wind and limb and a strong swimmer, your insurance premiums are paid up, and you can use a new thrill, spear fishing just might be your dish.

Careful—It's Habit-Forming

One warning: spear fishing grows on you. The writer modestly confesses that on the second occasion when he accompanied these deep-sea D'Artagnans, he couldn't resist taking a crack at it, made out moderately well for a neophyte and is itching to go back to the Keys for another session.

You don't have to go after the big stuff right off the bat. One New York physician who recently took up spear fishing turned into an avid *aficionado* almost overnight. He couldn't have been prouder if he'd hooked a whale with his scalpel when on his very first try he bagged three dandy flounder—each of which was maybe a bit bigger than your hand. There was some talk around that the doc was planning to have these monsters suitably mounted—for the wall of his study. END

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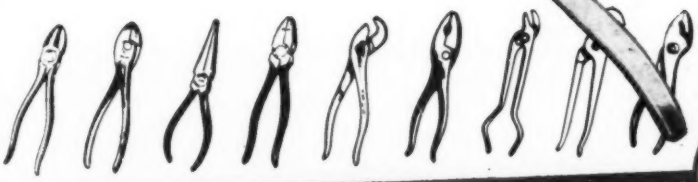
CHAMPION DEARMENT TOOL CO.
Meadville, Pa.



Channellock pliers are listed in the Yellow Pages of most Telephone Directories under "Tools"

Only CHAMPION DEARMENT . . .
makes CHANNELLOCK

New Hudson: Low, Fast and Tough

[Continued from page 124]

from a new, stiff car with Hydra-Matic.

I'm in Driving Range, stopped dead . . . and here goes the accelerator . . . wow! that squeaked rubber on take-off . . . there's 40 . . . and now 50 . . . 60 . . . and the stop watch says 15 seconds.

That was good. But for the power I had, not outstanding. Now I tried Low Range.

Dead stop . . . there goes the accelerator . . . I'm shifting into Drive at 40 . . . and there's 60 . . . in 14 seconds.

Hudson need make no excuses for that, but I'll bet a broken-in car will do better.

Mechanical Brakes Backstop Hydraulics

The brakes were soft and quick-acting. I wanted to see how fast I could bring the car to a stop from an indicated 60. Hudson's braking system is something extra. If your hydraulics go out for any reason, mechanical brakes take over when the pedal is halfway to the floorboard.

A light drizzle had moistened the macadam of the Speedway when I took off.

There's 60 . . . braking now . . . there's no grab . . . but brother! What a stop!

The distance, to which reaction time would have to be added, was 115 feet. I tried again. This time it was 113 feet. I settled for that. That's exactly 84 feet less than the book specifies for stopping from 60 miles an hour on *dry* pavement.

"Souped" Version Has Twin Carbs

The only real fault I have to find with the Hudson is its gas mileage. On last year's models, that ran to 14-plus miles per gallon at speeds between 35 and 45 miles an hour. With the Dual-Range Hydra-Matic transmission (PS, Oct. '51, p. 125) and a more favorable rear-axle ratio, Hudson expects better gas economy this year.

Teague, in grooming his Hudsons for stock-car racing, asked for, and got, double carburetors and twin intake manifolds for better engine "breathing." The result was inevitable—regular, non-racing buyers of Hudsons began asking for double carburetion and twin manifolding. Now you can get them, at slight extra cost.

But I'll tell you something confidentially: you really don't need 'em. END

UNCLE WALTER

IT SMELLS GRAND

SNIFF IT! YOU'LL SAY "THAT'S FOR ME!"

IT PACKS RIGHT

CUT TO PACK IDEALLY!

IT SMOKES SWEET

JOY YOU'VE DREAMED OF — YOU'LL AGREE!

IT CAN'T BITE!

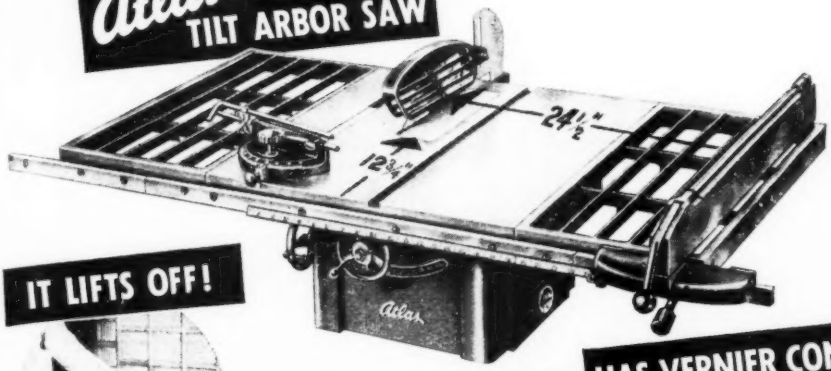
SIR WALTER RALEIGHS BLEND OF CHOICE KENTUCKY BURLEYS IS EXTRA-AGED TO GUARD AGAINST TONGUE BITE. STAYS LIT TO THE LAST PUFF. AND NEVER LEAVES A SOGGY HEEL IN YOUR PIPE.

It costs no more to get the best!

LOOK at the *Atlas* FENCE—TRY IT

It's the Easiest to Use, Most Accurate Fence Ever Developed

Atlas 10" TILT ARBOR SAW



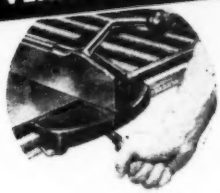
IT LIFTS OFF!

Releases instantly for lifting off or positioning either side of blade. A great time saver.

LOCKS AT BOTH ENDS!

One movement of the lever locks *both* ends of fence to table. It's *anchored* in place—can't move to spoil your work.

HAS VERNIER CONTROL!



Fence slides smoothly to position you want—has Vernier control for exact setting.

THE FENCE alone makes Atlas the saw to see before you buy, and in an Atlas you'll find a host of other advanced features that will be of great importance to you in your work. It has the capacity to build a garage, a house, or remodel a room—the accuracy for "factory-quality" work on fine cabinets and furniture, cupboards.

You'll like the big precision-ground grey-iron table; the smoothness and long-service of its large sealed-for-life ball bearings; the easy operating blade-height and angle controls. Blade cuts 3¼" deep—tilts to 45°—work is always flat. It's a big, rugged, fast, efficient saw—sure to make your shop and your work outstanding in the neighborhood.

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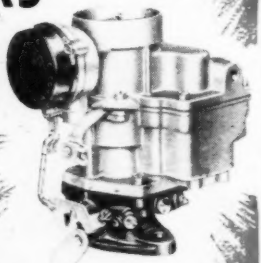

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St. Louis 7, Missouri
Division of American Car and Foundry Company

Which Twin Has the CMC?

[*Continued from page 169*]

a week for test laundering. Forty were treated with CMC and 20 with starch. CMC won in a walk. Its protective film made the shirt collars firm yet pliable. And it kept them white longer.

Used in a thinner solution, CMC gives the shirts of the anti-starch adherents a "man-of-distinction" finish without the glaze or stiffness which they abhor. At a cost of no more than half a cent a shirt, it defers soiling, makes washing easier and extends the presentable life of the garment.

Distribution Not Yet Nationwide

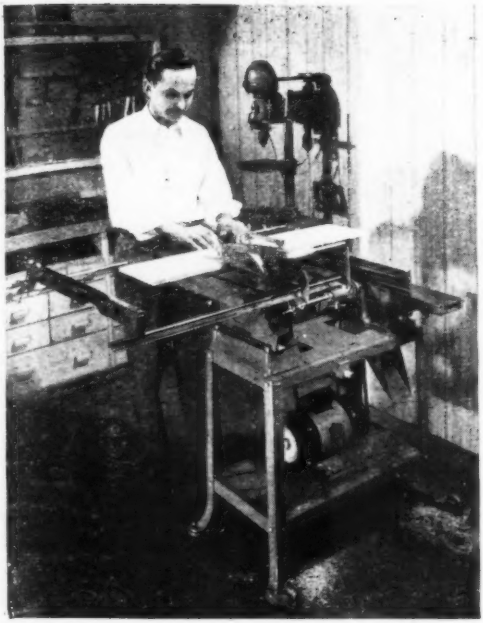
CMC was almost unheard of in the United States five years ago, and it still presents some problems of distribution. Laundries buy the powder in bulk and agitate it in water to make a stock of the syrupy solution which they ladle out as needed. Housewives can make up their own solution (it takes about 15 minutes with an electric mixer, somewhat longer by hand) or buy the syrup already mixed. Several companies market the ready-to-use liquid under a variety of trade names, such as GlossTex and Size-A-Kleen.

The Hercules Powder Co. began small-scale production of CMC powder in 1943, saw big possibilities, and built a multi-million-dollar plant in Hopewell, Va. Du Pont and the Wyandotte Chemical Co. of Michigan followed suit. In five years, U. S. use of CMC has zoomed from 300 to 22,000,000 pounds a year, and the price has dropped sharply.

Many Different Uses Foreseen

Half a hundred other uses have been found for the new chemical. Tasteless and harmless, it is used for thickening and to give smoothness to prepared puddings, syrups, sauces and processed cheese, as well as in printer's ink and the chemical mud used by oil drillers.

The full extent of CMC's use in home laundering will be a matter of household economics. At its present stage of development, it would appear that the saving in bleaches, bluing and soap or detergent would pay at least one-half the cost of the CMC. The balance is paid for many times over in terms of less scrubbing, improved appearance and longer life of the garment. It's a safe bet that you'll be hearing more about it. END



You can do almost every woodworking job you'll ever need in this DELTA WORKSHOP

. . . AND IT COSTS LESS TO OWN THAN YOU THINK!

These two Delta Power Tool units are the answer to your need for a complete yet flexible home workshop. For example, look at the tremendous versatility they offer:

- The Saw-Jointer combination performs all basic cuts—rips, miters, cross-cuts . . . makes compound miters, cut-offs . . . joints, planes . . . with accessories it makes dado grooves, shapes, tenons, rabbets, etc.
- With the drill press, you can drill, mortise, rout, carve, sand, shape, polish and grind—and with the exclusive Delta interchangeable spindle, it takes only seconds to put on the new cutting tool.

These power tools are ready to use *when* you want to perform any given operation. Behind them, too, stands the Delta guarantee of quality and precision famous throughout industry.

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- **HOMECRAFT UNIT** (4" jointer, 8" saw, 11" drill press) **$205.90**
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Motors and accessories extra.

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Ideal for Work in COLD WEATHER!

What a Bargain! These are surplus stock from a big supply firm. Warm, sturdy, serviceable work pants, though used, have been washed, sterilized and reconditioned. Every pair made of long-wearing, cold-resisting wash materials in a dirt repellent dark color. Strongly sewn, reinforced stitching at points of strain. Money back guarantee with every order!

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HASTINGS PISTON RINGS

Tough

BUT OH SO

Gentle

TOUGH on oil-pumping

GENTLE on cylinder walls

Using too much oil? You need the piston rings that are *tough* on oil-pumping.

Want to stretch your engine's life? Then get the rings that are *gentle* on cylinder walls.

There's just one thing to do about worn-out piston rings and that's replace them—and the more you delay the more you'll pay.

You'll save money if you replace them with Hastings Piston Rings. They're engineered exclusively for replacement service. They *stop* oil-pumping, *check* cylinder wear, *restore* engine performance—for thousands of extra miles. It's the best money you can spend on your car.

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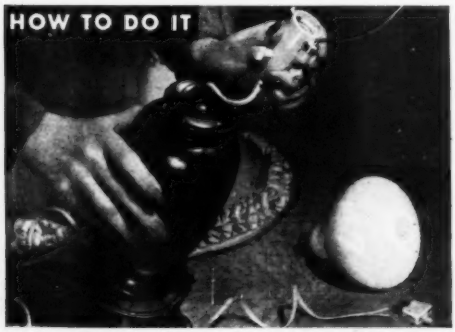
Piston Rings, Spark Plugs, Oil Filters, Casite, Drout

HASTINGS

STEEL-VENT PISTON RINGS

Easy, low-cost way to have 3-way indirect lighting in your old table lamps

In just minutes, you can convert your old table lamps to give you indirect lighting with three brightness levels! General Electric's new R-40 3-lite bulb, plus Monowatt adaptor kit, transforms your lamps as shown above—gives pleasing diffused light and choice of 150, 100, and 50-watts at the flick of a switch.



Using the special new Monowatt "Improv-a-lite" unit, you simply remove socket and wire, pull new wire through lamp, and screw on 3-lite socket. Then slide wire into plug, press down on lever, and it's ready for use!

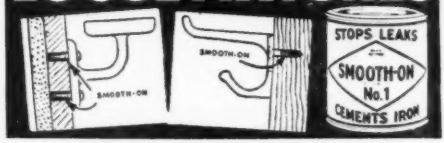
To learn where you can buy "Improv-a-lite" units and R-40 bulbs, if not yet available where you shop, write Monowatt Dept. PS2, General Electric, 95 Hathaway Street, Providence, R. I.

FREE BOOKLET—*gives tips on modernizing table lamps. For your copy of "How to Wire Lamps", write to address above.*

You can put your confidence in—

GENERAL ELECTRIC

TIGHTEN LOOSE FIXTURES



Smooth-On No. 1 Iron Cement applied to your loose hinges, door handles, coat hooks, drawer pulls, knobs, casters, bathroom fixtures, tool and cutlery handles, will tighten them and *keep* them tight. • Get Smooth-On No. 1 in 1¼ oz., 7 oz., 1 lb. or larger sizes at your hardware store. If they haven't it, write us.

FREE *Repair Handbook*

40 pages, 170 illustrations. Shows you how to make numerous household repairs quickly and easily. Directions are simple, brief.

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SMOOTH-ON MFG. CO., Dept. 58B
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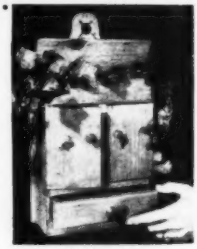
SMOOTH-ON
IRON CEMENT

The Spice Cabinet

Try this HIT WORKSHOP PROJECT! Mellow, knotty Eastern pine. Original copper hinges, other hard-to-get materials—all ready for you to build and finish this faithful Early American reproduction! 9" wide, 16" high, 5" deep.

SHIPPED KNOCKED DOWN, you build from plans. Smoothly sanded, all hardware and instructions included. **$4.50** POSTPAID

Send check or money order. We pay postage. No C.O.D.'s, please.



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Reconditioned and sharpened—ready to go! Many drills with extra lengths of flute. Immediate delivery. These drills are priced as low as 25% of your present cost and shipped post paid to you.

Size in in.	Twist Lgth.	Price	Size in in.	Twist Lgth.	Price
37/64	6 1/4	$1.00	1 1/8	8 1/2	$4.00
37/64	20	4.00	1-5/32	6 1/2	3.76
19/32	4 1/4	1.00	1-11/64	7 3/4	3.95
39/64	6 1/4	1.06	1-3/16	7 1/2	3.95
21/32	6	1.19	1-7/32	8 1/2	4.14
11/16	4 1/2	1.31	1-15/64	7 1/2	4.51
23/32	5	1.44	1-21/64	5 1/2	5.38
47/64	5	1.57	1-11/32	9 1/2	5.38
3/4	5	1.57	1-15/32	8	6.13
49/64	4 1/2	1.64	1-17/32	7	7.16
51/64	5 1/2	1.85	1-9/16	10 1/2	7.50
13/16	4	1.82	1 5/8	10 1/2	8.50
13/16	22	8.00	1-11/16	12	9.13
27/32	5 1/2	1.91	1 3/4	5	6.00
55/64	5 1/2	2.02	1 7/8	9	11.56
7/8	4 1/4	2.02	1-15/16	11	12.95
57/64	5 1/4	2.12	2 1/8	10	15.00
15/16	5 1/4	2.20	2-7/32	11	16.50
15/16	9 3/4	4.00	2 1/4	10 3/4	17.50
61/64	4 1/8	2.42	2-9/32	7 1/4	16.00
31/32	4 3/4	2.42	2-5/16	7	16.25
63/64	5	2.50	2 3/8	9	18.00
1-1/32	6	2.76	2 3/8	24	27.50
1-3/64	8	2.82	2-7/16	11	21.50
1-1/16	7 1/4	2.82	2-15/32	13	23.50
1-5/64	7 3/4	3.33	2 1/2	11	25.00
1-3/32	6	3.33	2-13/16	14 1/2	27.50
17/64	9	4.00	3	10	30.00
1-7/64	18 1/2	8.50	4	9	34.50

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33/64" to 1" by 64ths; 32 drills. New cost approximately $175.00. Only $49.95 PPD

1" to 1 3/8" by 64ths; 25 drills. New cost approximately $300.00. Only $79.50 PPD

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SET 1X 8 different size H. S. Std. Thread Hand Taps up to 5/8", including 2 Std. H. S. Pipe Taps. $2.95

SET 40X 16 same as above...$4.80

HIGH SPEED DRILLS

1/4" to 1/2" with 1/4" Shanks

1/2" to 1" with 1/2" Shanks

For the first time at these low prices! HIGH SPEED DRILL BITS UP to 1/2" FOR YOUR 1/4" DRILL AND HIGH SPEED DRILL BITS UP to 1-3/16" FOR YOUR 1/2" DRILL. The Tungsten steel content of these drills means they will outlast carbon and regular steel drills many, many times! Drills are used surplus: have plenty of flute length, are sharpened and ready for your drill.

DRILLS UP TO 1/2" FOR YOUR 1/4" DRILLS!

Will Fit Any Size Chuck 1/4" and Larger

SIZE	PRICE EA.	SIZE	PRICE EA.
1/4	$0.30	25/64	$[illegible]
17/64	.45	13/32	[illegible]
9/32	.45	27/64	.65
19/64	.48	7/16	.65
5/16	.48	29/64	.73
21/64	.50	15/32	[illegible]
11/32	.50	31/64	[illegible]
23/64	.55	[illegible]	[illegible]
3/8	.55	[illegible]	[illegible]

DRILLS UP TO 1-3/16" FOR YOUR 1/2" DRILLS!

Will Fit Any Size Chuck 1/2" and Larger.

SIZE	PRICE EA.	SIZE	PRICE EA.
33/64	$0.[illegible]	[illegible]	$2.25
17/32	[illegible]	7/8	2.25
37/64	[illegible]	57/64	2.25
19/32	[illegible]	59/64	2.40
39/64	[illegible]	15/16	2.43
41/64	1.43	31/32	2.50
21/32	1.43	1-1/32	2.80
43/64	1.58	1-1/16	3.05
23/32	1.70	1-5/64	3.56
47/64	1.80	1-[illegible]/32	3.60
49/64	1.80	[illegible]/64	3.60
3/4	1.80	1-1/8	3.98
25/32	1.86	1-5/32	3.98
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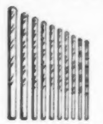
13/16	2.03	1-3/16	4.10
53/64	[illegible]		

Large quantities available in every size with special discounts for quantities. We can furnish drills from 1" up, with any size shank. Write us your special needs.

HIGH SPEED STRAIGHT SHANK DRILLS



SET 6X 30 selected H. S. Straight Shank Drills from 1/8" to 1/4", lengths up to 7". $15 value, only **$2.98**

SET 7X 12 different size H. S. Straight Shank Drills, 1/4" to 1/2", lengths up to 7", only..... **$3.98**

SET 8X 10 different size H. S. Straight Shank Drills, 1/4" to 1", extra long. $40 value. New and slightly used surplus.................. **$6.95**

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SET 25X 15 Different Size High Speed Morse Taper Shank Chucking Reamers up to 1/2" with No. 1 and 2 tapers. New and used. Priced at only **$6.95**

SET 13X 8 Different Size High Speed Morse Taper Shank Chucking Reamers from 1/4" to 1". New and used. Priced at only **$4.95**

SET 12X 10 Different Size High Speed Morse Taper Shank Chucking Reamers from 1/2" to 1 1/8". New and used. $65.00 value. Priced at only. **$9.95**

SET 23X 5 different size H. S. Morse Taper Shank Chucking Reamers from 1" to 1 1/4". New and used. Priced at only.............. **$11.95**

6 Slitting Saws with Mandrel

SET 34X 6 Different Size High Speed Slitting Saws, 2 3/4" dia. x 1" arbor. Thickness from .040 to .071. Cuts wood, aluminum, brass, steel, etc. PLUS SPECIAL MANDREL which enables use of saws in 1/4" or 1/2" elec. drill. $25 Value. Only........ **$4.95**

7 selected, sharp H. S. Slitting saws as above to use on your own mandrel or milling machine. New and used. A bargain at $4.95

HIGH SPEED WOODRUFF KEY SEAT CUTTER

SET 4X 5 different size cutters. Can be used as mounted milling cutter or circular saw. All with 1/4" and 1/2" shanks, widths up to 1/4", dia. up to 1". New and used. Priced at only... **$3.95**

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All Grinding wheels are new standard brands. 2"x1/4"x1/4" arbor MX polishing wheels..........25c ea.

2"x3/4"x1/4" arbor 60-grit wheels..25c ea.

2 5/8"x3/8"x1/4" arbor 60-grit wheels 25c ea.

3"x1/4"x1/4" arbor MX polishing wheels..............30c ea.

3"x1/2"x1/4" arbor 60-grit red wheels 30c ea.

4"x1/16"x1/4" arbor cut-off wheels 20c ea.

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Mandrel for using above stones in 1/4" drill ....12c ea.

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8"x1/8"x1/2" arbor cut-off wheel...70c ea.

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8"x1/8"x3/4" arbor cut-off wheel...70c ea.

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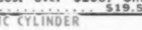

Bore 2", shaft 7/8", stroke 12 1/2", double action, double-end shaft can be mounted stationary allowing cylinder to slide. Wt. 14 3/4 lbs. Post paid to you at only $12.95

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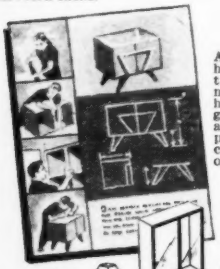

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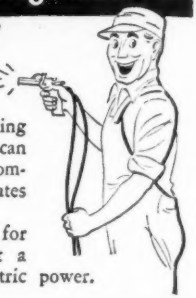

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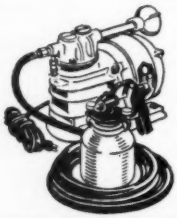

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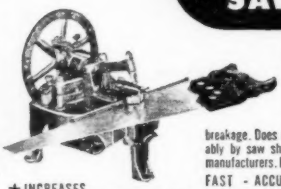

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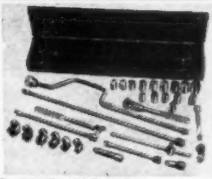

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Lee Wallard, winner of the 1951 Indianapolis Race at the record breaking speed of 126.244 m.p.h. average.

Tony Bettenhausen, 1951 AAA Champion Race Driver, with eight wins out of fifteen championship events.

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We will pay $2.00 for each new practical idea for using Pol-mer-ik Linseed Oil, which is acceptable to our research laboratory. Write Archer Daniels Midland, 604 Roanoke Bldg., Minneapolis, Minnesota.

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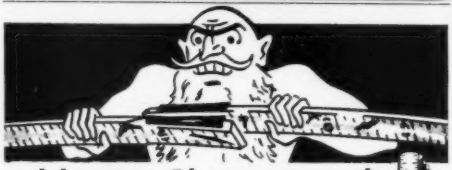
100% PURE LINSEED OIL



old man *Element* and the BARGAIN RULE!

When you buy an inferior folding rule, "Old Man Element" goes to work. Slyly he stretches each joint and wears away the finish. Then comes his knockout punch—moisture. Now the rule is inaccurate and ruins everything you measure . . . Be smart—don't just ask for a rule. Demand a MASTER BLUE TIP. Completely element proof, friction tested; patented brass joints won't stretch under roughest usage. Get BLUE TIP at your hardware store today. Regular or flat-reading, only $1.10.

Master Rule Manufacturing Company, Inc., Middletown, New York

I am enclosing $_____. Please send me _____ BLUE TIP rules.

NAME _____

ADDRESS _____

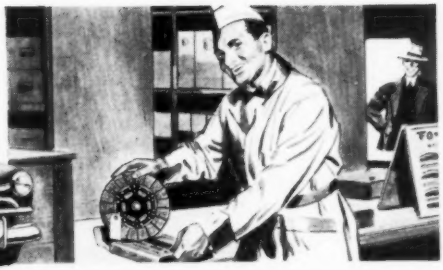
CITY _____ ZONE _____ STATE _____

MASTER

MASTER RULE MFG. CO. INC. Middletown New York

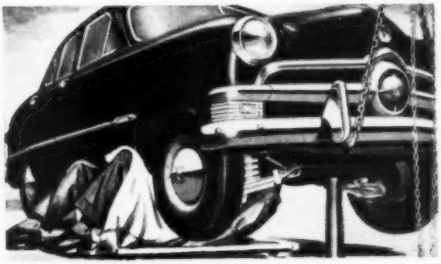
WOOD AND STEEL TAPE RULES

1 ounce = 44 lbs!

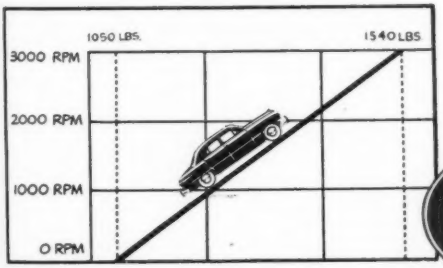


THAT'S WHY FORD IS SO CAREFUL TO BUILD CLUTCHES IN PERFECT BALANCE—WHY YOU SHOULD NEVER SETTLE FOR LESS THAN A GENUINE FORD CLUTCH. ANOTHER FORD ADVANTAGE!

ONE OUNCE OF UNBALANCE IN YOUR CLUTCH BECOMES 18 POUNDS OF UNBALANCE AT 3000 RPM, 44 POUNDS AT 5000. THE RESULTING VIBRATION CAN MAKE A RATTLETRAP OUT OF A GOOD CAR.



THESE ARE BUT A FEW REASONS WHY THIS CLUTCH, LIKE ALL GENUINE FORD PARTS WORKS BETTER—WHY IT SAVES YOU DOLLARS THROUGH QUICKER INSTALLATION AND PROTECTION AGAINST SLIP.



STANDING STILL, A GENUINE FORD CLUTCH GRIPS WITH 1050 POUNDS PRESSURE. AS THE ENGINE SPEEDS UP THE CLUTCH HOLDS TIGHTER. AT 3000 RPM THIS PRESSURE INCREASES TO 1540 LBS.

GENUINE Ford PARTS

AVAILABLE WHERE YOU SEE THIS SIGN . . . AT ALL FORD DEALERS AND SELECTED INDEPENDENTS.

ALWAYS INSIST ON THE PARTS THAT ARE MADE RIGHT TO FIT RIGHT TO LAST LONGER!

KEEP YOUR FORD ALL FORD!

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The most practical garden tractor ever built. You can instantly change tractor speed, while tractor is running, yet always have maximum power at the drawbar! You select the speed to suit the job. Other new features include Safety Reverse and Free Wheeling. Complete line of implements for year 'round use. Don't buy a tractor until you've seen the new Bready! WRITE TODAY for free literature, name of dealer.

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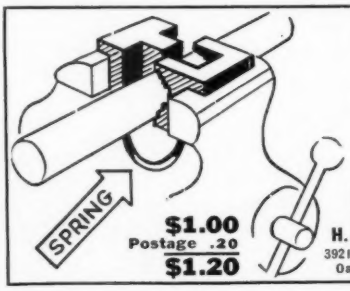

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Two DREMEL Electric SANDERS with

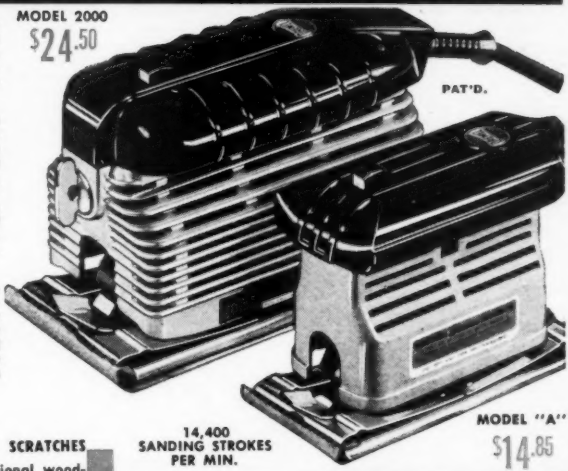
STRAIGHT LINE Action for Guaranteed SCRATCH-FREE Surfaces

Perfect answers to any sanding problem, both Models feature: Only 2 moving parts; 14,400 strokes per min., easy one-hand operation; dust-proof—foolproof; 10-second paper change; 110-120 V., 60 cycle A.C. PLUS—straight-line action for mirror-smooth finishes. ***Don't settle for less!***

MODEL 2000 FOR HEAVY DUTY CRAFT AND WOODWORKING PROJECTS—Fastest seller in the field for rugged power and smoothest finishes at lowest cost. Ample power for furniture and cabinet making, boat building or refinishing, resurfacing large areas. Great for building operations—woodwork, stairs, dry-wall joints, siding, etc. Does a superb polishing job! Weighs 5 lbs; 21 sq. in. of sanding surface; over-all size 3⅛" x 4½" x 7". ***Price includes steel carrying case,*** 25 asst'd. abrasive sheets, and a sheepskin pad.

MODEL "A" FOR HOBBIES, REFINISHING, RE-DECORATING—Finest sander ever offered housewives, home-owners, hobbyists. A lighter-capacity model for woodwork, unfinished furniture, hobby shop projects, etc. Wonderful for polishing waxed surfaces. Also a soothing massager! Weighs only 2½ lbs. Sanding pad 2¼" x 5½". Price includes 6 sandpapers, 1 sheepskin, 1 felt pad.

MODEL 2000 $24.50



14,400 SANDING STROKES PER MIN.

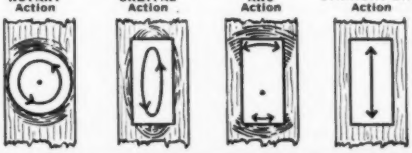
MODEL "A" $14.85

ONLY STRAIGHT-LINE ACTION . . .

SANDS WITH THE GRAIN — NEVER MARS OR SCRATCHES

Don't just take our word for it. Ask any professional woodworker about sanding action. He will tell you that only straight-line, with-the-grain sanding can produce a flaw-less finish.

BEFORE YOU BUY ANY SANDER . . . COMPARE!

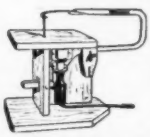


DREMEL Electric COPING SAW

CUTS SCROLLS LIKE MAGIC—SANDS AS IT SAWS

MAKE YOUR OWN JIG SAW PLANS FREE!

JUST GUIDE IT! SAFE! AS A HANDSAW



For home, hobby, repair work—no other tool pleases so much for so little cost. Works in any direction—delivers 7,200 strokes per minute smoothly, effortlessly. Saws through ⅜" medium-hard wood at a foot-a-minute speed. Touch-of-the-trigger, foolproof action. Only 2 moving parts, never needs oiling. Uses 110-120 V., A.C. Free plans, packed with each saw, for six useful woodworking projects and for making your own jig saw.

GRINDS • CARVES • ENGRAVES
DRILLS • ROUTS • SHARPENS

DREMEL Electric MOTO-TOOL

FASTEST MOST POWERFUL TOOL
In Its Class—Approx. 27,000 R. P. M.

Most practical tool a man can own—more powerful than any similar tool you can buy. Works well in wood, plastics, and metal. For home maintenance jobs you'll wonder how you got along without it. For model making it's a **must.** And for general shop operations it saves time and money. Compare it, try it, buy it. You be the judge!

CHECK THESE IMPORTANT FEATURES—Oilless sealed bearings • Dynamically balanced armature • Shock-proof, Bakelite housing • Dust-filtered air cooling system • Sturdy 110-120 V., A.C.-D.C. motor • Wt. only 13 oz. • **A precision tool widely used in industry for many years.**

MOTO-TOOL NO. 2 (with 1 emery wheel point) $16.50

MOTO-TOOL KIT NO. 2 With 23 Accessories (High-Speed Steel Cutters, Grinding Wheels, Polishers) $23.50

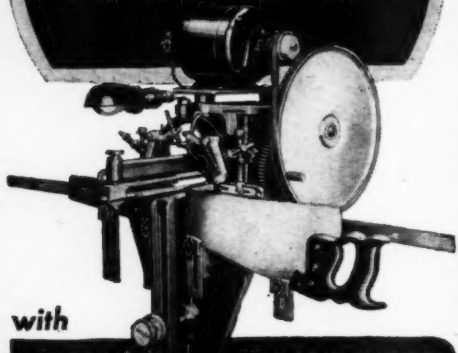
You Be The Judge of Dremel Products—Our reputation has been built on results rather than sensational claims. We invite comparison of Dremel tools with any similar products made. Then you'll know why we guarantee the most for your money!

DREMEL

Where To Buy—If your dealer doesn't carry, rush in full for postpaid ship't. Or send only $2 now, pay postman balance plus postage and COD fee. Five-day trial, money-back guarantee!

DREMEL MFG. CO., Dept. 122-B, Racine, Wis.

Made $900 IN SPARE TIME



with

FOLEY automatic SAW FILER

*Trade Mark Reg. U. S. Pat. Off.

"I did very well last year with my Foley equipment, about 950 saws in my spare time. About $900 for me."—Leo H. Mix. "I have done 4 or 5 thousand saws in my spare time in the 4½ years since I got the outfit, and they are all coming back."—says Len Crego.

Make up to $3 or $4 an hour in spare Time. With the high prices of food, clothing and everything else, just think what you could do with extra money every week! With a Foley Automatic Saw Filer you can file hand, band and circular saws better than the most expert hand filer. "The first saw I sharpened with my Foley Filer came out 100%"—writes Clarence E. Parsons. Every saw you sharpen with the machine accuracy of the Foley Saw Filer is an ad that brings you more customers. Cash business, no canvassing. No eyestrain, no experience needed.

FREE BOOK "MONEY MAKING FACTS"

Shows just how you can start at home in spare time in your basement or garage. Just think—with a small investment, no overhead, no stock of goods to carry, you can get right into a cash business—and later on develop into a full-time repair shop. Send coupon today for this practical plan. No salesman will call.

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Send FREE BOOK—"Money Making Facts"
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WHY NOT SAVE GAS?
Try Ganes At Our Expense

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BOOK GIVEN FREE TO ALL WHO TRY GANE NEEDLES
GANES REPLACE CARBURETOR IDLING ADJUSTMENT SCREW
Install Ganes in a few minutes on all cars

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TEST FOR
✔ BETTER MILEAGE
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MANY GANE USERS REPORT UP TO 25% MORE MILEAGE AND ALL-AROUND BETTER PERFORMANCE . . . but don't take our word for it . . . see for yourself! Test Ganes in your car for 10 days **AT OUR EXPENSE.** Then, compare your mileage and performance and, if fully satisfied, pay only $1.50 per needle (8 cylinder cars use 2). If not satisfied, simply return them and owe nothing . . . fair enough? Since authorities differ on the merits of Ganes, and some users report no improvement, **TRY BEFORE YOU BUY!**

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ALSO FREE... Auto Economy Manual SENT ABSOLUTELY FREE TO ALL WHO TRY GANE NEEDLES, tells how to save fuel, tires and brakes, how to obtain more speed, power and better performance from any car. Also introduces many new, ingenious auto economy products.

WRITE TODAY! ENCLOSE NO MONEY! PAY POSTMAN NOTHING!

List your name, address, make and year of car, no. of cylinders and make of carburetor if known. YOUR TWO FREE BOOKS AND GANE NEEDLES WILL BE SENT IMMEDIATELY.

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350 W. Washington Blvd., Venice, California

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THE AMAZING NEW DISCOVERY!
STOPS ANY LEAK INSTANTLY!

MONEY BACK. GUARANTEE!

NOT AFFECTED BY GASOLINE, OIL, NAPTHA, ALCOHOL OR WATER!

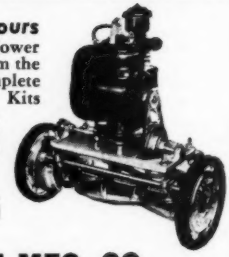
Seals on contact! Permanently seals leaks in plumbing lines, gasoline tanks (without draining contents), garden hoses, fuel tanks and lines, etc. Mends household articles and toys—insulates electric wiring, waterproofs spark plugs and ignition systems—binds wood, metal, glass, fabric, plastic! SEAL-ALL sticks to anything—never becomes brittle! Results guaranteed, or money refunded. Nothing like it on the market! Send $1 to R. A. SHANNON & COMPANY, 103 MECHANIC STREET, PONTIAC, MICHIGAN. We pay postage.

$1

$100 WORTH OF REPAIRS FOR

Convert HAND MOWERS TO POWER MOWERS

Takes less than 3 hours
The Handy-Dandy Lawn Mower Kit fits any hand mower from the 16 to the 20 inch size. Complete with all necessary parts. Kits can be purchased separately, complete with engines or complete with Pennsylvania mower.



Also manufacturers of complete power mowers and garden cultivators.

LE CLAIRE MFG. CO.
LE CLAIRE, IOWA, Dept. PS

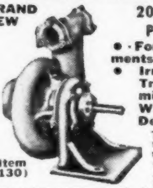
GROBAN'S WAR SURPLUS BARGAINS!

BRAND NEW • UNCONDITIONALLY GUARANTEED

General Motors — Allison

CENTRIFUGAL PUMP

BRAND NEW



(Item #130)

200 GALLONS PER MINUTE

• For Draining Basements • Fire-Fighting • Irrigation • Fuel Transfer • Swimming Pools • Home Water Systems • Dewatering

This General Motors-Allison Centrifugal Pump—designed for use on U. S. Air Force Mustang fighters, now converted for commercial, home, and industrial high volume pumping applications. Inlet, 2½" standard pipe thread, twin outlets with 1¼" pipe thread, ball bearing supported ¾" shaft. Easy, fast simple priming. Rotation, counter-clockwise facing shaft. Shipping wt. 35 lbs. Gov't acq. cost $145.00.

NOW ONLY 39.50 F.O.B. Chgo.

Suction Lift	Head Pressure	Gal. Per Min.	H.P.	R.P.M.
10'	75'	260	6.0	3500
10'	65'	200	5.2	3500
10'	80'	40	1.5	2500
10'	50'	140	5.0	3500
10'	30'	100	3.0	2500

D.C. GENERATORS

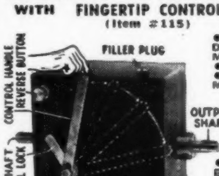
For welders, plating, truck and marine use. D. C. appliances, lights, etc. Aircraft quality —lifetime grease sealed ball bearings. Heavy duty.

Item #90—Type P-1, rated 200 Amps.—28 Volts, 2500 RPM. Mfd. by General Electric, Ford, Delco-Remy and Westinghouse. Gov't Acq. Cost $300.00. Shpg. wt. 53 lbs. F.O.B. Chicago.................. **22.50**

Item #91—Type R-1, rated 300 Amps.—30 Volts. Mfd. by Jack & Heintz. Gov't Acq. Cost $380.00. Shpg. wt. 59 lbs. F.O.B. Chicago. Each individually packed in wooden box.................. **35.00**

HYDRAULIC SPEED REDUCER

WITH FINGERTIP CONTROL (Item #115)



USE FOR: • Reamer Drives • Midget Cars • Feed Mills • Canning Machines • Conveyors • Lathes • Milling Machines • Motor Boats • Cream Separators • Garden Tractors Pumps.

Variable output speeds from 0 to input speed available by moving control handle. Locking handle maintains setting. Internal relief valves prevent overloading. Use input power of ¼ to 1½ H.P.

This Westinghouse-Oil Gear Unit converted to commercial use from 40 MM anti-aircraft traversing mechanisms consists of a variable displacement hydraulic pump feeding a fixed displacement hydraulic motor. Adjustable relief valves set at factory for 100 inch pounds of torque may be reset up to 180 inch pounds. Independent reverse control allows full output power and speed selection in either direction of rotation. Both input and output shafts measure ⅝" diam., include **keyway. Input** rotation is counter-clockwise facing shaft. Recommended input speeds not to exceed 750 R.P.M. Over-all dimensions 7½"x7½"x11½". Gov't. acquisition cost, $428.00. Shipping weight 31 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago........... **54.50**

FREE: NEW 1952, 48-PAGE CATALOG loaded with unsurpassed War Surplus Bargains. You save on everything. Write today.

Write, Wire or Phone WEbster 9-3793

PREPARE NOW FOR POWER FAILURE

IMMEDIATE DELIVERY—LARGE STOCK—MANY SIZES

GENERATING PLANTS

Plenty of Emergency Stand-By or General Utility Power, from 350 Watts to 25 KVA.

ITEM #183

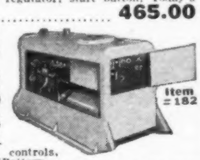
Item #183 —3000 to 4000 WATT GENERATOR SET

FEATURES—Power for your home or business. Simply connect to power panel or house circuit. • Constant voltage regardless of load • Push button start or stop. Easily made full automatic start or stop. • Circuit breaker stops plant in event of short circuit.

Item #178

SPECIFICATIONS—Sizes 19"x30"x48". Steel skids, weatherproof housing, requires no building. Wt. 725 lbs. • Hercules 4-cyl. 10 HP gasoline engine. Load governor. Oil filter. Quiet muffler. 6-volt starter, generator • Hobart 115-volt, 60 cycle, 3,000 to 4,000-watt generator. Furnishes either single or three-phase power, 2 or 3 wire. • Panel contains oil gauge, voltmeter, ammeter, circuit breaker, voltage regulator, start button. Today's Cost Over $1,200.00. SALE PRICE. F.O.B. Chicago.............................. **465.00**

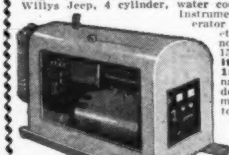
Item #178—350 watt—110 volt—60 cycle A.C. direct coupled to 1 cylinder Midco engine. Shpg. Wt. 116 lbs. F.O.B. Chicago............... **125.00**



Item #182

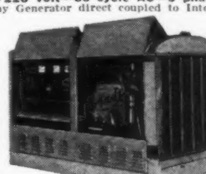
Item #182—Onan Generator—5KW—120/240 volt—60 cycle A.C. single phase, direct coupled to Willy's Jeep 4 cylinder, water cooled engine with push button start, battery ignition. (Battery not included.) Shpg. Wt. 1200 lbs. F.O.B. Chicago........................ **795.00**

Item #201—PE 95-G—10 KW—110 220 Volt—60 Cycle A.C. Single Phase. Totally enclosed. Onan generator direct coupled to Willys Jeep, 4 cylinder, water cooled engine, push button start. Instrument panel with engine and generator instruments, circuit breaker, controls, etc. Uses 6 volt car battery. (Battery not included) Skid mounted. Shipping weight 1500 lbs. F.O.B. Chicago........................ **1295.00**



Item #180

Item #180—15 KW—127/220 volt—60 cycle AC—3 phase 1800 RPM. Brance & Krachy Generator direct coupled to International Harvester 4 cylinder, water cooled engine with magneto ignition—push button start. Panel has voltmeter, ammeter, 4-wire electrical system, belt driven exciter generator, rheostat voltage control. Engine and generator mounted on steel skids. Shipping weight 2000 lbs. (Battery not incl.) F.O.B. Chicago......... **1650.00**



Item #128

Item #128—25 KVA-250 volt, 3 phase-120 volt. Single phase—60 cycle. Totally enclosed Hobart generator driven by a GMC 270, 6 cylinder gas engine, button start, liquid cooled. Has control panel with full set of instruments for both engine and generator. Shipping weight 2600 lbs. (Battery not incl.) F.O.B. Chicago **2250.00**

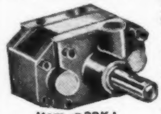
Write for free information on other size generators from 350 watts to 25 KVA.

HEAVY DUTY

HYDRAULIC EQUIPMENT

AIRCRAFT QUALITY

Large supply of new labor-saving, economical hydraulic equipment in many types and sizes. Use these positive, highly efficient smooth pressure hydraulics on presses, arbors, lifts, loaders, power control, positioning, brakes, plastic dies, auto frame alignment, etc.



Item #29KJ

ITEM #29 KJ—GEAR TYPE HYDRAULIC PUMP. Ideal in Industrial Applications and for operating all hydraulically powered farm implements, including loaders, stackers, swathers, plows, etc. Delivers 1,000 PSI, (may be set at lower PSI if desired), 12 GPM @400 RPM. Maximum operating speed 800 RPM—rotation counter clockwise. Has built-in relief valve, permanent or torque bar mounting, 1" diam. shaft, ¾" pipe tap inlet, ½" pipe tap outlet. Shipping weight 22 lbs. F.O.B. Chicago........................ **45.50**

ITEM #127—Double acting hydraulic cylinder, 1" bore, 1" stroke, ½" diam. shaft, ¼" tubing thread ports. Over-all length closed—6½". Clevis mounting at both ends. Perfect for clamping and feeding. **Postpaid**...... **5.95**

ITEM #16 C—Double acting hydraulic cylinder, 1½" bore, 26" stroke. Will lift 1760 lbs. with 1000 PSI line pressure. Weight 8 lbs. A $55.00 value. Now Only, **Postpaid**......... **16.95**

ITEM #126—Four-way, open center control valve with built-in adjustable relief valve. Factory set at 1000 PSI., spring-loaded neutral position for use with one double-acting cylinder. Fully balanced plunger type, smooth, positive, easy operation, can be used as single unit or mounted in series of any combinations desired. Has ¾" pipe thread inlet and outlet, ½" pipe thread cylinder ports. Newly manufactured to our specifications. Shipping weight 8¼ lbs. An outstanding buy! F.O.B. Chicago.................. **21.50**

Item #126

Item #42

ITEM #103—Double acting hydraulic cylinder, 2½" bore, 17" stroke. Clevis mounting. Will lift 4900 lbs. with 1000 PSI line pressure. 1¼" diam. shaft, ⅜" tubing thread ports. Overall length closed 28". Shpg. wt. 11 lbs. F.O.B. Chicago **21.50**

ITEM #6—Double Action hydraulic cylinder, 3" bore, 24" stroke, will lift 7070 lbs. with 1000 PSI line pressure. Steel barrel, 1¼" stainless steel shaft. Gov't. acq. cost, $176.00 Shpg wt. 26 lbs. F.O.B. Chicago **28.00**

ITEM #42—Double action hydraulic cylinder, 4" bore, 18" stroke. Rated lift capacity with 1000 PSI line pressure is 12,500 lbs. Ship. wt. 30 lbs. F.O.B. Chicago. Excellent Buy for.............. **32.50**

New Model 353 Dual Range

D.C.ARC WELDER

for Stationary or Portable Use. HEAVY DUTY RANGE TO 250 AMPS. NEW 'MAGIC TERMINAL' FOR LOW CURRENT 30 TO 100 AMPS. IDEAL for: • FARM • GARAGE • FACTORY • WORKSHOP

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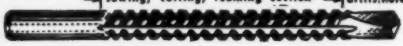

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. . . metal, pipe, wood, plastic, Transite, etc., with the all-purpose International Rotary Cope-Saw Drill-bit shown above. Use with any electric drill, slow drill press, lathe or milling machine. Drills own starting hole—upper part of bit is used to cut, saw or ream circles, ovals, squares or scrolls. Easy to operate. Ideal for carpenters, mechanics, electricians, plumbers, hobbyists, many others. Abrasive resistant, high speed steel. Flutes ground from solid. Will withstand severe continuous use without breaking. Resharpened at no charge. Takes place of up to $50 in tools. ¼" diameter, 2" cutting sections, total length 3½". Also available bits specially designed for wood or metal and in 2⅜" and 1¾" lengths. Write for details. Specify all-purpose bit.

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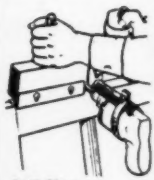
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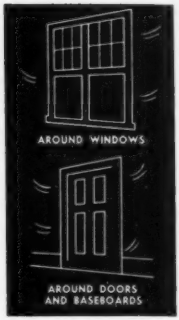

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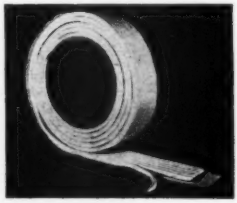

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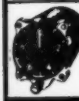

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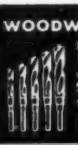

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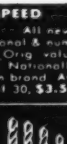

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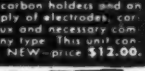

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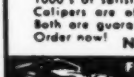

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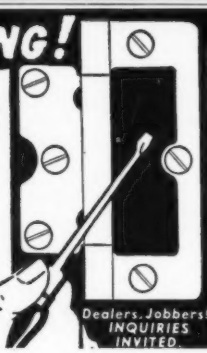

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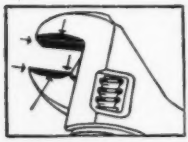

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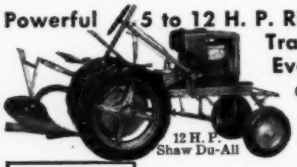

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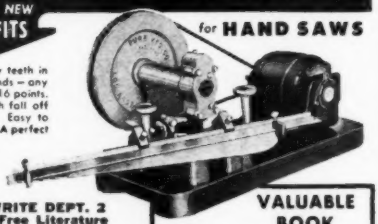

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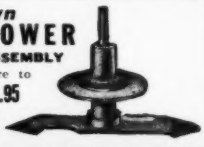

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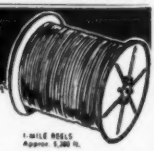

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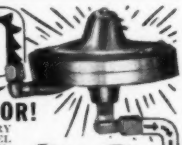

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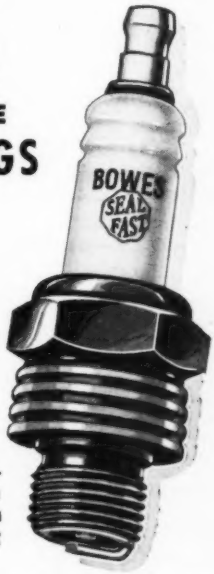
BOWES DEPENDABLE SPARK PLUGS Assure SMOOTHER MOTORING



There is a Bowes Spark Plug specially designed for your car! Oversize Special Alloy Electrode—with welded construction for positive connection assures longer life. One-piece, leakproof construction.

Every Bowes Plug is individually tested to assure complete motoring efficiency. INSIST on BOWES SPARK PLUGS FOR SMOOTHER MOTORING.

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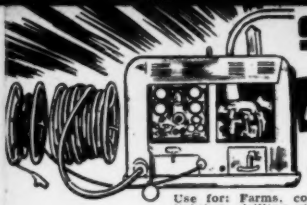
INDIANAPOLIS 7, INDIANA



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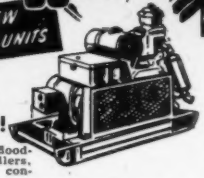
ON THESE BRAND NEW WAR SURPLUS POWER UNITS

BE PREPARED for any emergency!



Use for: Farms, cottages, stores, garages, floodlighting, drilling rigs, refineries, house trailers, fire departments, sound trucks, yachts, tugs, construction, airports, police radios, etc.

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300 WATT 110-220 v. AC. 60 cycle light plant powered by 1 HP gas engine, direct drive, mounted base, wgt. 40 lbs. Ideal for campers, F.A. systems, house trailers, etc. Equipped with handle for easy carrying **$99.00**

750-1000 WATT, 110 v. AC. 60 cycle, direct drive, air cooled, Briggs & Stratton gas engine. Model AP. Pioneer generator, radio filter, self-excitor, rope start. 190 lbs. 20" long, 17" wide, 16½" deep with carrying handle. New..... **$169.00**

1000-2000 WATT 110 v. AC **$194.00**

2000-2500 WATT 110 v. AC. 60 cycle, slow speed generator. 5.10 HP Briggs & Stratton gas engine. **NEW** **$294.50**

To make plant 110-220 add **$40** for transformer.

2500-3000 WATT 110 v. AC. 60 cycle. Leland generator, runs at slow speed (1800 rpm) for longer life. 8.25 HP Briggs & Stratton gas engine. You can rely on this plant for all average home needs—freezer, stoker, pump, hot plate, radio, etc., and overloads from starting motors. Reconditioned and fully guaranteed.. **$295.00—NEW . $345.00.** Plants, same as above, built in 1951, with tools and spare parts. Lists at $790.00. Our price **$426.00**

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5000 WATT 120 v., 60 cycle AC. Hercules 4 cyl. gas engine. Generator mfr'd by Hobart Bros. Unit includes remote control cable, 150' 2-wire #6, and 150' 3-wire #18, exhaust pipe, power cable plug, spare parts, manual, battery, radio and TV filtered. Unit is completely automatic. List price today $1910. Now priced for you at **$675** used, **NEW** .. **$895.**

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4 Wire #18 Neoprene standard, per ft.		**7c**
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4 Wire #10 75 ft. length, per ft.		**40c**
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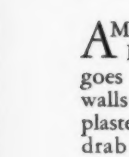
15 Cond. #18 G.E. Stranded 50-500' O.D. 13/16", per ft.		**50c**
10 Cond. #18 Solid, per ft.		**10c**
Telephone Wire 250', per ft. 2c; 1000'		**1½c**



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300 Watt, RPM 3400, 110 and 220 v., ½" shaft, **$40.00.** 2500-3000 Watt, RPM 1800, 115 v. AC, **$225.** 3000 Watt, RPM 2800, 110 v. DC, Delco ball bearings, 1" shaft. List $343. To you at only **$99.** 5000 Watt, 115 v., RPM 1800, single phase **$259.** 10,000 Watt, 110-220 v., 60 cycle, 1200 RPM, **$550. TRACTOR DRIVEN GENERATOR** 2500 w. 110-220 v. with Floating mount to keep belts tight **$287.** Generator only **$235.**

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Electric. Prevents frozen water pipes at temperatures as low as 35° below zero.

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Thermostat for above set at 35° F.	**5.00**

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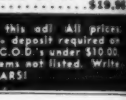

Warms up fast—just the thing for heating trucks, buses, garages, etc. Has an output of 50,000 BTU'S per hour. 24 v. DC. Length 23", diameter 13", wgt. 14 lbs. Original cost $130. Special, **NEW** **$19.95**

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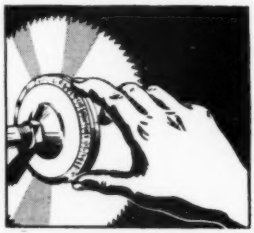
NOW—40 different cuts with AMAZING, NEW

Warren DADO SAWING WASHERS



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NO Burning!

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Make clean, smooth parallel grooves at any angle—no chewing, no sanding. Just dial your cut—no trick screws, no vibration, strengthens blade for straight cuts. Warren Washers greatest improvement in 30 years—and most copied—look for the name on the box and washers. It costs no more to get the best—WARREN, IT'S GUARANTEED! At your dealer or order direct. Give arbor size—½", ¾", ⅝", 1"—sent postpaid.

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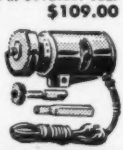
½ HP, 3450 rpm. 110 or 220 v. dustproof motor mounted on universal swinging trunnion. Heavy base has convenient tool tray and large, easy rolling casters. Flexible shaft is equipped with full speed angle and straight spindles. Lists at $172.00. Your price with all attachments **$109.00**



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Get all the convenience of a dumb waiter elevator in store, shop, restaurant or home at lowest cost. We furnish complete parts for elevators similiar to those described in ARTICLE on pp. 174-177 Dec. '51 issue of POPULAR MECHANICS. Steel Car—Guide Rails—Worm Gear—Limit switches—Electrical Controls—Steel Cable. SEND 25c for completely diagrammed instructions with list of parts, kits and prices.

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Fits any 8", 9", 10" furnace pipe. 1500 RPM motor with 6' cord, mounting frame, 7" blade. Motor 110 volt 60 cycle. 1550 RPM. Easy to install. Silent operation. Warm those rooms with long runs. Regular $83. Your price **$6.95**

Steel framed, easily mounted SIGNAL exhaust fans. Operate in vertical or horizontal position. Quiet, long life ball bearings.

FANS	FAN SHUTTERS
8"..$12.95	$4.50
9"..16.95	4.95
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Speed switch for any model..... **$4.50**

High Volume BLOWERS

Top performance for forced draft, ventilating, exhausting, cooling and drying. 110 volts AC. Intake 3", discharge 2¼" 75 cubic ft. per min... **$10.95**
Intake 5", discharge 3" 150 cubic ft. per min..... **$13.95**

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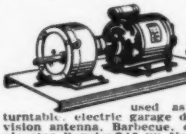

Double reduction. Operates on any 1/6 to 1½ HP electric motor. 22 RPM. Can be used as winch, operate turntable, electric garage door opener, television antenna, Barbecue, dummy elevator. Regular $45.00. Now Only **$22.00**

54 TO 1 BOSTON SPEED REDUCER

Reduces speed of ordinary 1750 rpm electric motor to 33 rpm. Lists at $55.00. Our sale price **$29.50**

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Gas or electric. Awarded from government.

½ HP	12 gal. tank	$ 99.00
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1½ HP	50 gal. tank	265.00
2 HP	50 gal. tank	295.00
3 HP	60 gal. tank	410.00
5 HP	60 gal. tank	485.00
7½ HP	80 gal. tank	675.00
10 HP	80 gal. tank	775.00

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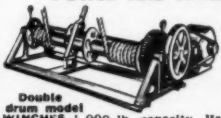

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WINCHES Single drum. ¾ HP motor 110 or 220 AC. Start, stop and reversing switch, belt, pulleys. 100' 3/16" steel cable. 2000 lb. pull. Ratio 12 to 1. NEW $125.00. Double drum model..... $135.00
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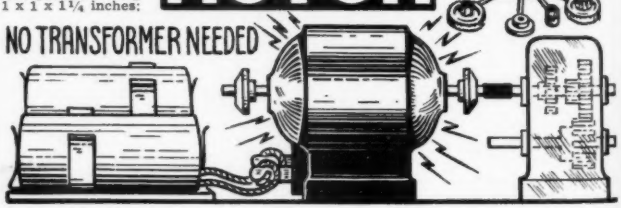

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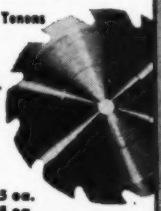

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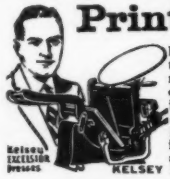

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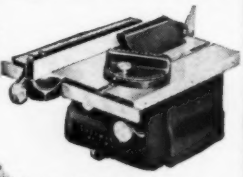

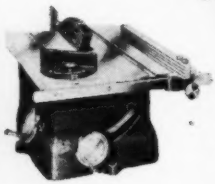

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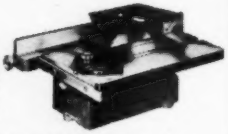

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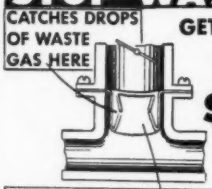

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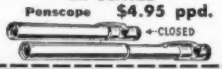

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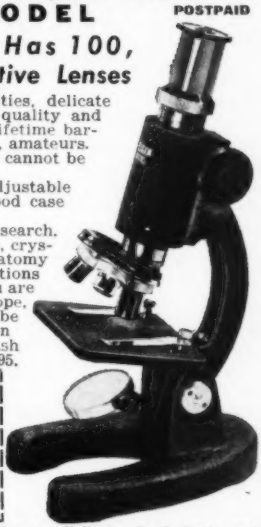

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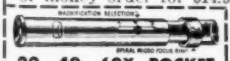

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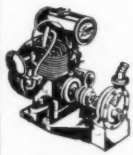
ORIGINAL "Type P" Pump has 1,001 year 'round uses—home, shop, garden, farm. **DRAINS** cellars, cisterns, wash tubs, ditches, pools. IRRIGATES gardens, lawns, truck patches. **SPRAYS** crops, orchards. **CIRCULATES** oil, coolant. **SUPPLIES** water to elevated tanks from wells as deep as 25 feet. 2400 gals. per hr. capacity. 360 GPH 75' high. 1500 GPH from 25' well. 1" suction and 3/4" discharge ports fitted for hose. Use 1/8 to 1/2 HP motor or engine. 1/2" Stainless Shaft; Oilless Bearing. **DOES NOT CLOG OR RUST!**

ONLY $6.95

WHICH OF THESE 5 PUMPING UNITS DO YOU WANT?

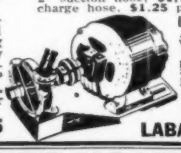
Easy to Assemble! Easy to Use!



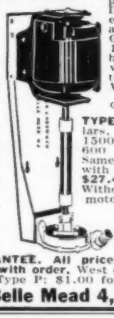
LITTLE GUSHER Irrigates, drains, waters livestock, fights fires! Pumps 2000 GPH 25' high or 360 GPH 75' high. 2 HP engine with 3" power take-off V-pulley. Adjustable from 1700 to 4500 RPM. Portable. Dollar for dollar, pound for pound, the best pump value at **$69.00**
Complete with 1½" Bronze Foot Valve, 1½" suction hose, **$1.25** per foot, 1¼" discharge hose, **$1.00** per foot.

BIG GUSHER Pumps 7000 GPH. Complete with 3' of 2" suction hose and 2" foot valve, only **$89.00**
2" suction hose, **$1.75** per foot, 1½" discharge hose, **$1.25** per foot.

TYPE C-4 Direct drive. Ideal for plumbing fixtures below sewer line. Complete with 1/4 HP motor, **$25.95.** Without motor only **$11.25**



LOW-COST ACCESSORIES
All Bronze Foot Valve for 1" hose **$3.45**
1" Suction Hose, per foot 38
3/4" Discharge Hose, per foot . . .22



TYPE D-3. Cleans 40' well or cesspool quickly! Drains, irrigates, etc. Operates in any position. 400 GPH 40' high; 1400 GPH 20' high. Complete with 1/3 HP motor **$32.95**
Without motor, only **$12.85**

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AUTOMATIC SWITCH for 24" sump, fits D-3 and D-4, **$4.60.**

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Buy any size door or hardware either separately or in a prefabricated package with no extras needed.

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Please send me complete information on your sliding doors and hardware for self-installation.

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Coarse one side, fine the other, its grinding-wheel grit restores dullest edges to razor-sharp keenness. CRYSTOLON stones are oil-filled, sharpening time is reduced, and the stone lasts a lifetime. Get a CRYSTOLON Stone at your hardware store, or direct.

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Genuine Carborundum wheel ideal for shop or home use. Send remittance with order and shipment will be made at once, prepaid to your door, complete with electrical goods catalogue.

Motor driven **$9.75** complete with vise

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Cool, clean, water-washed air while sanding, grinding, paint spraying. Why breathe harmful dust, smoke, fumes? Guard against harmful dusts, coal, cement, metal, lint, grain dust. Order now!

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LOCKS onto the work "HOLDS ON," after you let go.

Finest locking plier because...

Clamps on better with *patented swivel jaw* which adapts itself to shape being held. **Faster working** because of *patented jaw size indicator;* you pre-set jaw size to approximate size of object. **Easier opening** with *patented lock release;* finger-operated lever readily releases 2000 pound bite.

$1.95 7" size
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Both bright nickel finish

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Cuts 1/8 to 13/16" in steps of 1/16"
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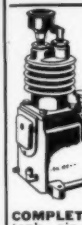


Wellworth AIR COMPRESSOR

For Farm and Home Workshop

Compressor has 2" bore, 1¾" stroke, 2.8 cfm up to 150 lb. pressure. Motor required: ¼ h.p. at 100 lbs.; ⅓ h.p. at 125 lbs.; ½ h.p. at 150 lbs. or equivalent gas engine. V-belt drive, intake muffler and cleaner, bronze bearings, splash lubrication. Wt. 16 lbs. Replacement parts always available **$20.50**

COMPLETE OUTFIT. Compressor, pressure tank, air gauge, air chuck, 20 ft. hose, pop valve, copper tubing with 4 brass flared fittings for connecting compressor to tank, 4-way cross and 3 nipples. COMPLETE OUTFIT, wt. 30 lbs..... **$32.45**

Equipment less compressor..... **$12.45**
Tank only, $6.25

Wellworth COMPRESSOR BUY

1 YEAR GUARANTEE

FEATURES

2 compression and one oil ring, aluminum alloy connecting rod. Stainless steel valves with brass seats and retainers. Cool-flo cylinder head, spray mist lubrication to every moving part. 10¼" V groove fly wheel for ⅝" B section belt.

Model W3
2½" x 2". 2.55 to 4.80 c.f.m. up to 150 lb. pressure. Operates with ⅓—½ ¾—HP Motor. Special Price. **$27.95**
Shipping wt. 24 lbs.

Model W7
2 cylinder 2½" x 2". 5.10 to 8.50 c.f.m. up to 150 lb. pressure. Operates with ½—¾—1—1½ HP motor. Special Price..... **$54.50**
Shipping wt. 45 lbs.

"WELLWORTH" BLOWER BARGAIN

BRAND NEW. Quiet operating. Double wheel inlet, double width blower. For heating, ventilating, cooling, air washing, exhausting and forced draft. DIMENSIONS: 10" wheel; outlet 13⅛" x 11⅜"; inlet 8⅜". Height 19". Width 18". Depth 16½". C.F.M. ¼" S.P. 1600; outlet vel. 1575. Wt. 45 lbs.

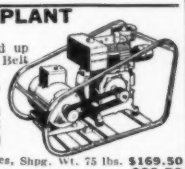
BLOWER LESS MOTOR AND DRIVE..... **$27.50**

With belt and variable speed pulleys, $2.50

Same Blower, complete with ¼ HP Motor... **$47.50**

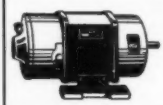
2000-2500 WATT LIGHT PLANT

Heavy Duty Windings



110 v., 60 cy., A.C., takes starting overload up to 5000 watts. Floating Base for Automatic Belt Adjusting, 2-Groove Engine Pulleys, V-Belts, Bolts, etc. 5 H.P. Wisconsin or Briggs & Stratton Model 14 Engine. Voltmeter, 2 plug-in receptacles. Portable Tubular Steel Skid Type Carrier. Dim. L 34⅝" x W 17" x H 20"
Wt. 180 lbs. **$299.50**

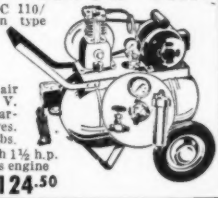
Generator only with voltmeter, 2 plug-in receptacles, Shpg. Wt. 75 lbs. **$169.50**
500 watt Generator, wt. 55 lbs. **$99.50**
5000 to 6000 watts Generator, 110-220 V., wt. 225 lbs. **$325.00**
5000 W. Light Plant, 110/220 V., Wt. 575 lbs. **$645.00**



LELAND GENERATOR

2500 to 3000 watts, 110 v. 60 cy. single phase 1800 r.p.m., self excited. Fungus treated for long life. 1951 model. Brand new, in original factory crate. Shipp. wt. 135 lbs. List $375.
SPECIAL PRICE..... **$225**

AUTOMATIC COMPRESSOR UNIT



⅓ H.P. heavy duty capacitor motor, AC 110/220 volt, 60 cycle, 2x1¾ inch piston type compressor, splash feed lubrication, 12x24 inch tank, automatic pressure switch, CFM 2.8 at 100 lb. pressure, or 150 lbs. pressure for intermittent duty. Check valve, safety valve, air regulator with gauge and filter, 20 ft. air hose with air chuck for inflating tires. V. belt drive. Mounted on 2 wheels, ball bearing, with 2"x10" semi-pneumatic tires. Portable with handle. Shipping wt. 90 lbs.

With ⅓ H.P. motor **$160 Value** **$98.50** — Less Motor **$79.50** — With 1½ h.p. gas engine **$124.50**

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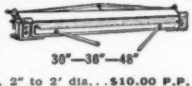
Forms angles, flanges and Pittsburgh locks. 26 gauge steel, heavier aluminum. Cam locking. Portable, can be bolted to bench, or clamped to edge of truck. All steel, reinforced. Shipped Exp. Coll. 30" size, Wt. 54 lbs., **$26.50.** 36", Wt. 66 lbs. **$31.00.** 48", Wt. 100 lbs., **$45.00.** Floor mountings, portable, 32" high, 30 lbs., **$7.00.** 12" **BRAKE.** Fits in vise to form difficult compound bends, up to 20 gauge steel. Not illustrated..... **$12.50 P.P.**



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24" CURVE FORMER, 2 roll, 16 gauge, 2" to 2' dia... **$10.00 P.P.**
IRON BENDER. ¼x2" capacity, 10 parts. All steel.... **$10.00 P.P.**
Immediate delivery. Order direct, cash or C.O.D. or send for folder.

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Happy hobbying for you . . . happy playing for the youngsters. Full size patterns—trace and cut out. Send for **Patterns P1:** Paddle Wheel Boat, Clacker, Tumbling Clown, Cradle, Insert Toy and Fighting Roosters, all for 25c postpaid. STANLEY TOOLS, 422A Elm St., New Britain, Conn. In Canada: Stanley Tool Company of Canada, Ltd., 422A Stanley St., Roxton Pond, Quebec.

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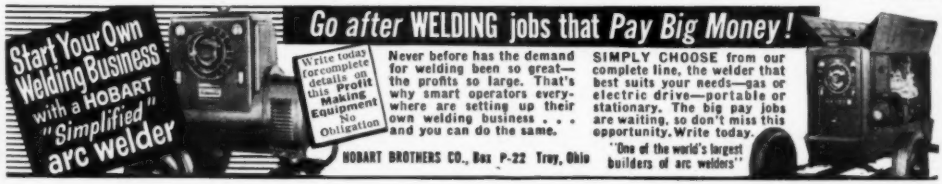

Why let your cellar pipes be eyesores?

Aluminum Krylon coating adds color, stops "sweating." Use wherever you'd use aluminum paint. Just spray it on!

If you prize it— "KRYLON-*ize*" it!

Aluminum Krylon Acrylic Spray is as different from paint as summer from winter! It covers more surface, is easier to apply, cleans easier, lasts much longer, waterproofs completely. Won't crack, peel, dry out, or change color. Krylon is an ACRYLIC coating that *seals* surfaces—protects, preserves, beautifies. Just press a button, spray Krylon on. Use aluminum Krylon wherever you'd use aluminum paint. At hardware and paint counters everywhere in 12 oz. aerosol spray cans.

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Spray on almost any metal, paper, leather or wood surface. Rustproofs metal. Dozens of uses in every home and workshop.

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Keep Paint Brushes Like *NEW!*

Store Them Dry. They Stay Soft and Flexible READY FOR INSTANT USE!

PROCESS 33

INSTANT PAINT BRUSH CLEANER

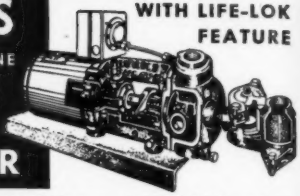
- Quickly cleans fresh paint from a paint brush or roller.
- You can paint instantly with another color—or store brush dry—it will stay soft.
- Economical—can be used again and again.
- Safe for all brushes and rollers.

Pint 59¢ Quart 98¢ Gallon $3.25

BURKS

SUPER TURBINE PUMPS LAST LONGER

ONLY PUMP WITH LIFE-LOK FEATURE



Thanks to the LIFE-LOK feature, the BURKS Super Turbine Water System lasts up to 40% longer than any other kind, delivers more gallons per minute and provides "like-new" performance and efficiency when other types would be worn out. It's completely automatic—self-priming.

FREE BOOK PICTURES PUMP DETAILS

Send today for "The Story of Burks"—a 32-page book giving detail drawings, graphs, etc. See why BURKS is finest engineered system . . . why it delivers more water per hour . . . why it's the finest water system you can buy. Write to—

DECATUR PUMP CO., 72 Elk St., Decatur 70, Ill.

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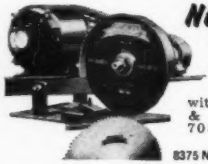
PALMGREN "HOBB-E" Rotary, Index, Milling Table

Ideal for Model Parts or Shop Work

Mill-Grind-Drill-Index-Rout curved or straight-Rabbet and Mortise on drill press or lathe. 8" Table, 4" Cross Feed, 360° Rotation, Accurately Graduated. Bolts to table. Order NOW! SAVE $100. Only **$54.50.** Less Rotary Feed **$43.75.** Write for **"HOBB-E"** Tool Circular.

CHICAGO TOOL and ENGINEERING CO.
8396 South Chicago Ave. Chicago 17, Ill.



NEW Saw Sharpener

Improved #64 Hand Gummer sharpens all types circular saws 4" to 20" diam. Ideal for saw shops. Self-Centering adjustment for quick, easy set-ups. Complete with 1/4 HP motor, 1 grinding wheel & cord. **$79.50** FOB Portland. Wt. 70#. SEND FOR FREE LITERATURE.

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GENERATOR REGULATOR BATTERY

REPLACE VOLTAGE REGULATOR WITH AMAZING NEW WATTAGE REGULATOR

GREATEST ADVANCEMENT IN AUTO IGNITION SINCE THE SELF-STARTER

DRIVE WITH OR WITHOUT BATTERY

100,000 MILE MONEY BACK GUARANTEE

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Clean and Mothproof rugs and upholstery "in the home" or public buildings. If now employed, you can operate in spare time and build up a permanent profitable full-time business. Alert dealers can average $4.50 hourly gross profit on service they render and $3 on **EACH** of their servicemen at National Price Guide charges. Easy to learn . . quickly established.

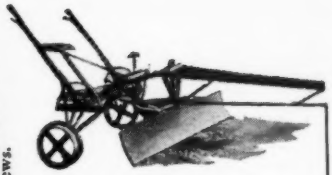
DURACLEAN cleans by absorption! No scrubbing, soaking or shrinkage. Dirt and grease vanish . . matted pile rises . . colors revive. Furnishings used again same day.

DURAPROOF resists moths and carpet beetles. Your service backed by a National Money Back 4 Year Warranty.

We furnish enough material to return your total investment in war-proof business. EASY TERMS. Send for **FREE** booklet TODAY.

Duraclean Co., Dept. 2-182, Deerfield, Ill.

W. H. Schlafke, Jewell, Iowa, mounts his LeJay Welder on tractor by an easily removed frame held by set screws.



T. F. Waller, Circle, Mont., won first prize in our recent welders' contest with this grader and terracer made at "very low cost" with a Model 200 LeJay Welder.

Wilfrid Wassenberg, Marysville, Kansas, loads up to 240 bales hourly with this bale loader. His LeJay Welder is driven by a Model A Ford engine.

Robert Anderson, Winnebago, Minn., fabricated this steel trailer with his LeJay Welder. "I have welded car fenders, cast iron, steel, aluminum, bronze . . . have used it continuously all day . . . with very little amperage drop."

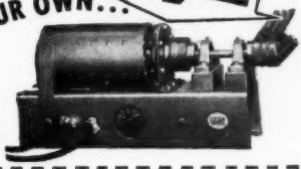
Ray Burton, Chicago Heights, Ill., built this Army "Jeep" with his portable LeJay Welder. A Clinton 2.9 H.P. motor propels it at 10 M.P.H. in third gear.

Heavy duty utility hoist also made by Wassenberg with his LeJay Welder. Capacity is 1500 lbs.

S. J. Sedlacek, Barnes, Kansas, built this portable grinder with his LeJay Welder for "on the job" use. According to Sedlacek, ". . . it's the cheapest piece of machinery on the place."

COMPARE THIS!! 250 AMP. D.C. WELDER KIT— $39.95

ASSEMBLE YOUR OWN...



SAVE HALF!

PAY FOR YOUR WELDER... BY WELDING FOR OTHERS!

NOW, at a fraction of its original cost, you can make your own welder using any aircraft generator. You can not only save money, but a few repair jobs for your friends will quickly pay for your welder. Only a pair of pliers and a few minutes are needed to assemble this kit into a sturdy welder giving you many years of useful service—with satisfaction guaranteed.

HERE'S WHAT YOU GET:

No. AW5-Kit includes these ten parts: (1) special hook-up leads (2) amperage control with leads (3) Hi-Lo switch (4) mounting plate (5) pillow bearings (6) bearing supports (7) shaft extension (8) flexible coupling splined to fit your generator (9) triple groove "B" type pulley (10) complete assembly plan.

No. AW5-Kit Complete $39.95

No. AW6-Kit includes AW5-Kit above plus Arc Stabilizer $49.95

No. AW9-Kit includes AW6-Kit plus P-1-200 Amp. Generator (250 amp. short welding periods) $67.90

(P-1-200 Amp. Generator Cost Govt. Approx. $200.00)

EXTRA! A $15.95 Accessory Kit Complete for only $12.95! Includes: (1) Welding Helmet (2) Electrode Holder (3) 5 Lbs. Ass't. Rods (4) Two 10-Ft. Welding Leads with Terminals and Ground Clip, Plus (5) Audel's Welding Guide.

SOLD WITH ANY WELDER KIT.....Special Price $12.95

PLANS 35¢—LeJay's proven plan for building your own welder using aircraft generator. Catalog included.

FREE! **BIG NEW CATALOG OF ELECTRICAL BARGAINS AND SURPLUS ITEMS—WRITE FOR IT!**

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623 LEJAY BLDG. • MPLS. 8, MINN.

DOUBLE ARC MOTION

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SANDING ACTION!

No 504 DeLuxe with Metal Case

Four reasons why new Syncro No. 504 is your best sander buy: (1) tremendous increase in power, (2) exclusive Double Arc Motion combines best features of orbital, straight-line sanding that DOUBLES sanding action, (3) light for easy vertical or overhead work, (4) sanding area approx. 14 sq. in.! SYNCRO gives a satin-smooth, high gloss finish. Ideal for polishing, too. COMPLETE with new BUILT-IN Reactance Type Electric Motor, 10 sand-papers, lamb's wool and fabric polish pads, at dealers or postpaid. Deluxe No. 504 in metal carrying case. Send for FREE CIRCULAR! (Dealers, Jobbers—write!)

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SHARPENING LAWN MOWERS IN YOUR SPARE TIME

J. S. of Michigan writes, "I figure my profits for last season at over **$1,000.00 part time.**" C. R. of Ohio tried the Universal on a part-time basis and now gives it full time. He says "I have taken in, last season, **more than $3,500.00.**"

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can the inside face and edge of the stationary blade, and all reel blades, be ground to proper clearance

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WITHOUT REMOVING ANY BLADE FROM THE MOWER

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Please send me full details about the profit possibilities of Lawn Mower Sharpening.

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- Cabinet Scraper
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PLUS ALL STEEL UTILITY BOX

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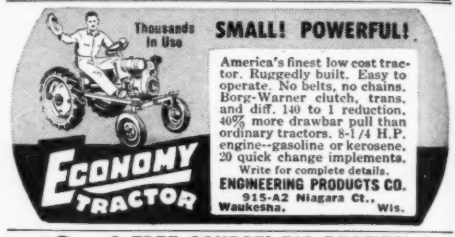

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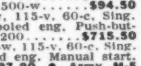

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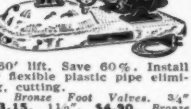

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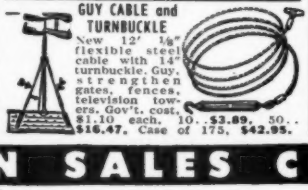

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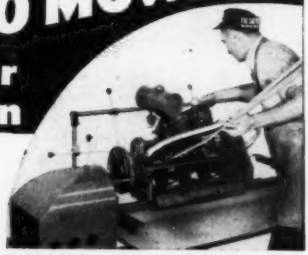

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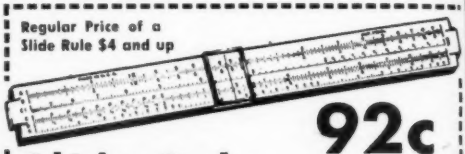

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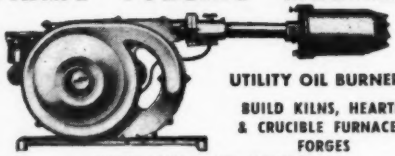

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A $20 VALUE

EXACTOR HYDRAULIC REMOTE CONTROL

MASTER & SLAVE Consists of two units. Designed to operate controls on boats, machinery, engines, motors, etc. without need for rods, cables, pulleys, etc. When connected with ¼" tubing & filled with oil they act as a precision, remote controller. When Master handle is moved, Slave arm responds in exact motion. Range is 0 to 90 degrees. Combination Master & Slave for **42.50**

MASTER only – For an extra control . . . **21.25**

MICROPHONE

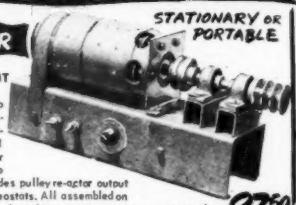
Telephone type, highly sensitive with excellent, Clear tone. This was the Signal Corps favorite. An ideal instrument for the radio "ham" and professional recording studio, broadcasting, home recording, public address, etc. . . Complete with cord & plug . . . **3.29**

A SENSATIONAL BUY!

NEW! 1952 CATALOG

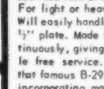
OVER 230 PAGES COMPLETELY ILLUSTRATED Showing Thousands of items in **NEW** and **WAR SURPLUS!** Some at **SAVINGS** up to **85%!** Clothing, Household Items, Power and Hand Tools, Camping & Outdoor equip., Farm & Ranch supplies, Electrical and Pneumatic equip., & a huge stock of Hydraulic equip., including Cylinders, Valves, Pumps, Motors, Fittings, etc. Send only 50¢ for your copy TODAY!

D.C. ARC WELDER



300 AMPS CONTINUOUS 350–400 AMPS. INTERMITTANT For light or heavy duty work. Will easily handle welding up to ½" plate. Made to operate continuously, giving years of trouble free service. Built around that famous B-29 (R-1) generator incorporating many features no other generator has. Unit includes pulley re-actar output controls. Hi-lo switches & rheostats. All assembled on heavy steel frame and easily adapted to mounting on jeep or tractor for portability & power supply. Can be run on 7½ H.P. electric or 10 H.P. gas motor. Generator alone cost Gov't $400! **NOW ONLY 97.50**

CHEMISTRY SET

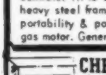


Made for Chemical Warfare Division for testing, water, etc. A handy addition to the chemistry lab. or an exciting experiment for the amateur. Set includes test tubes, complete instructions. 15 different items. Packed in attractive lucite box with cover and dividers . . . **1.89**

AN – JC-48 HARNESS WIRE

20, 16, 12 GAUGE Handy for emergency repairs on radios, aircraft, autos, boats, etc. Sold only in bundles of 6 pounds or more. These bundles are in mixed gauges and lengths very clean and unravelled. This is wire that normally sells for 4¢ to 5¢ per foot. Our price makes it approx. ½¢ per foot. 6 lbs. for **ONLY 2.95**

NAVY Sealed Beam LAMP



U.S. NAVY portable search-spot light. Has pistol grip and aiming sight. Makes an ideal search, spot or emergency light for auto, boat, etc.

12V. light – 4" lens . . . **4.29**

24V. light – 5" lens . . . **4.79**

Set of 3 filters: red, green, amber (specify type lamp) . . . . . **99¢**

STOP WATCH

Genuine 9 Jewel Waltham Watch. Large sweep sec. hand circles full dial in 10 sec. Smaller dial records up to five minutes total time. NEW ONLY **17.95**

17 JEWEL CHRONOGRAPH – One of the finest made anywhere. Sweep second hand, stop and re-set button. Measures airspeed, groundspeed, races, etc. Ideal watch for the sportsman. **26.95**

NAVIGATORS LAMP

A handy light for desk, workbench, chart table, engine room, etc. Can be used on 6-12-24 & 110 Volt by changing bulb. 3 ft. shaft has 4 joints to adjust position. **3.29**

17 JEWEL AUTOMATIC

A fine, self-winding watch for men. Winds itself as you wear it. Has genuine Incablac (shock protected) movement. In choice of Silver White or Black face. Water-proof case with stainless steel back. Has full sweep second hand. Comes with genuine leather strap. Factory guaranteed for one year. **26.95** (plus 10% Federal Tax)

TACHOMETER

Operates on direct drive with a flex shaft from camshaft or at 2 to 1 reduction from crankshaft. Range is 0 to 4500 R.P.M. Ideal for planes, boats, autos, etc. **4.75**

HUNTING KNIVES

GENUINE G.I. EQUIPMENT. Has a 6 inch, polished Vanadium blade & Handle made of leather and fibre discs. Complete with tanned leather sheath. Only **1.98**

7 x 35 BINOCULARS

The Very POPULAR CENTER FOCUS Model with Coated, Achromatic Lenses. Combines higher resolving power with extreme image brightness and amazing clarity. An IDEAL GLASS FOR ALL AROUND USE DAY or NIGHT! Has Lightweight, Precision made, Aluminum housing. Field of view is approx., 375 feet at 1000 yds. Complete with Leather Carrying Case and Neck Straps. **47.95** (PLUS FED. TAX)

NYLON FISHLINE

STRONG – LIGHTWEIGHT – NYLON FISHING LINE. ROT-PROOF and WATERPROOF . . .

1500 ft.	10 lb. Test	$1.59
1000 ft.	25 lb. "	$1.80
750 ft.	45 lb. "	$3.29
750 ft.	50 lb. "	$3.50
300 ft.	72 lb. Braided	$3.79

7 X 50 PRISM BINOCULARS Big, Powerful Lenses give maximum image brightness & needle-sharp vision. Individual eye focus, Wide field of view. With Leather Case and Straps. **33.95** (plus Fed. Tax)

HAND LINE

Rot-proof, weather resistant, hard linen line. Originally used as hand line in fishing for tuna, marlin, etc. Also has many uses around farm, factory, etc. NEW in 300 ft. lengths. **1.69**

THROAT MICROPHONE

Genuine USAF – Type T-30-0 " 2 'phones' on rubber neck-piece & elastic band. 100 to 300 ohms. **1.39**

NEW!!! LENSATIC COMPASS

Officer's type. A precision compass of unusual accuracy. Has prismatic, hair-line guide for sighting at distant objects & at same time reading the degree. Luminous dial for night, jewel mounted needle. Canvas carrying case for belt. NEW. **Only 3.95** 5.95 VALUE

A.F. FLEECE LINED JACKET

GENUINE LEATHER Will keep you warm and comfortable in the roughest weather. Has fleece lining throughout . . . sleeves & body. Two roomy, slash pockets & full zipper front closure. Really an ideal jacket for all Outdoorsmen . . . Hunters, Farmers, Mechanics, Ranchers. RE-CONDITIONED in WONDERFUL CONDITION. **12.95**

FLYING HELMET

Fine grade leather – Chamois lined with chin cup and strap. Intermediate weight. NEW – ONLY **1.59**

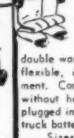
ALL NEW! Winter type with fleece or chamois lining. Has ear puffs and chin cup. Ideal for pilots, cycle-drivers and sportsmen **ONLY 1.95**

Aviators (AN-6530) Windproof & Dustproof GOGGLES

Rubber or chamois covered frame. Clear or green GROUND LENSES are inter-changeable. Adjustable nose bar. Ideal for flying, motorcycling, etc. . . . . **2.19 USED 3.95 NEW**

GO-1 GOGGLE KIT NEW! U.S. NAVY Has soft sponge rubber frame. 4 Poloroid lenses, 2 green; 1 red; 1 clear. Perfect for racing, cycling, etc. . . . . **SPECIAL 89¢**

FLYING SUIT or Blue Bunny SUIT



For hunting, winter sports, skiing or "bundling". As coveralls, for cold outdoor or farm work. 100% woven wool with extra flannel inner lining for double warmth and utility. Wiring so fine, flexible, it does not interfere with movement. Can be used with or without heating or can be plugged into car, tractor or truck battery . . . . . **ONLY 4.95**

Sizes: 36 thru 44

16 POCKET VEST

The ideal jacket for the Rifleman or Hunter . . . Has 14 individual, outside pockets for shells, glasses & other accessories. 2 large (11" x 8") inner pockets, a leather holder for knife, gun or tool. Sturdy, yet lightweight with tie-straps at back for adjustable fit **3.49**

Hunting & Field BOOTS

Assures complete foot and shoe protection in the coldest weather. Specially designed to keep the feet warm and comfortable & the shoes dry. Has 9 inch leather boot top, rubber shoe & sole with felt inner sole. Reconditioned – in excellent condition. **3.95**

A PALLEY BUY NEW **4.95**

Navy WADING SUIT

Adds real pleasure to surf & deep stream fishing. Made of rubberized canvas. Vulcanized seams. Has inner air pockets, to give buoyancy & balance in deep water. Finest quality, rubber gloves & ½ length rubber boots attached to sleeves and pants legs **7.95**

SIZES: small; medium; large

PALLEY SUPPLY CO. DEPT. PS-2 6321 SAN FERNANDO RD GLENDALE 1 CALIF.

ORDER FROM THIS AD. All sales final. Prices F.O.B. Glendale. Pay by M.O. or Check. P.O.'s accepted from D&B Firms. ½ deposit with C.O.D.'s

Over the North Pole on One Engine

[Continued from page 113]

He raised his sextant, preset it for 90 degrees north and squinted at the sun. And there it was, dead center in the bubble.

He had reached the North Pole!

Mail Drop for Santa Claus

Out of the sliding window zipped the letter to Santa Claus, and a wave of emotion swept over Blair. That penciled scrawl was going to land close to the spot where, locked in ice, reposes one of history's milestones, a monument to human courage. Almost half a century ago six swaddled figures had stood down there, planting the Stars and Stripes, while one of them, through cracked and bleeding lips, said, "I . . . formally take possession . . . in the name of the President of the United States." It had taken Robert E. Peary 23 years of successive effort to cross that last 400 miles of icecap.

Now came the test of tests for Blair. At the precise moment when he crossed the Pole everything in the world, all oceans, countries, all humanity, lay south. It was like sitting up above a Maypole, faced with one's pick of countless streamers. Just one led to Point Barrow, Alaska. Its neighbors streamed off to Siberia, to Greenland, to wastes of sea and land. It was unlikely that Point Barrow's radio signals could reach him for another four hours. Until they did, the sun remained the only guidepost that could show him the way home.

Sun Creeps Behind

In the past five hours, as the earth had turned, the sun had crept from behind Blair's left shoulder and now was slowly moving up toward the bow of his plane. It had begun to glaze the blue gray mist, making it difficult to see ahead. He rose to 25,000 feet, where the glare was less, and bored on, cleaving the ghostly silence.

Two hours from the Pole, the sun reached a point immediately above Excalibur's nose. Blair was now flying in a globe of shining haze which shut off visibility in all directions. With every hour the glare increased and the cockpit seemed to shrink. He felt as if he were the loneliest human being in the world.

Then he flicked a switch, setting the radio direction finder for Point Barrow. The needle quivered into life, swung, steadied, came to rest. *Dot-dash-dash-dot—dash-dot-dot-dot—dot-dash*—the faint, intoxicating music of humanity. *PBA PBA Point Barrow calling—step lively mister, this way for home, this way to people, houses, trees, this way back to a cockeyed, wonderful old world . . .*

Sun Is the Loser

Blair passed over Point Barrow one minute ahead of flight plan. Less than two hours later postal authorities at Fairbanks, Alaska, began to stamp hour-of-arrival on the first polar air mail. Those 3,000 postcards had flown across the rooftop of the world so fast that they had beaten the sun from Norway to Alaska by more than half an hour. Actual flying time was 10 hours 27 minutes. Blair, 10 pounds lighter following those 3,300 miles sweating inside an oxygen mask, was aching and weary, but exultant. His one-man charge against the icecap had transformed the mirage of shorter, swifter, cheaper air routes over the North Pole into reality.

A few days later, spruce in his company uniform, Capt. Charles Blair stood at Idlewild, watching his passengers embark on the great Stratocruiser he was about to fly to London.

"I see some nut just flew across the Pole—alone," one passenger was saying. "Crazy, I guess!"

Blair grinned.

"Could be," he said. "Seems like some guys just have to get that North Pole out of their systems!" END

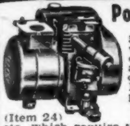
Electric Sparks Carve Hard Metals

[Continued from page 120]

Teubner didn't know what principle he had stumbled upon—but it was plain that he had something. He raised a little capital, moved his experiments from the basement of his home in Upper Darby, Pa., to larger quarters and formed the Method X Co. to exploit his discovery. Last year a leading Pittsburgh maker of carbide materials and tool and die steels, the Firth Stirling Steel & Carbide Corp., bought a controlling interest in Teubner's firm and joined in developing the process.

Currently Method X is being introduced to industry. Military applications, too, are under development—one possibility is a rifled liner of heat-resisting carbide for machine-gun barrels. END

BUY DIRECT - MASTER MECHANIC - UP TO 85% DISC.



Portable LIGHT PLANT

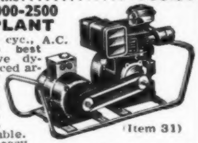
PUSH BUTTON START

500-700 watts 110-120 v. — 60 cyc. A.C. Powered by a sturdy dependable, easy starting, air cooled 1¾ hp. gas engine. No wiring necessary, just plug in and operate. Plenty of current for any oil burner, freezer, brooder, etc. which require up to 700 watts. Ideal for Civil Defense, Fire Depts., emergency lights, trailers & camps. Complete with Voltmeter and Built-in winding to charge 6 v. auto batteries. Wt. 85 lbs. Fully guaranteed. **Be prepared if war or storm knocks out power lines.**
(Item 24)
Reg. $275.00 value $143.50

700-800 Watt Plant (Item 44) Same as above but greater output. $165.95

1000-1200 Watt Plant (Item 45) same as Item 24, but larger generator & engine $199.50

GIANT 2000-2500 WATT PLANT



(Item 31)

110-120 V. 60 cyc., A.C. **Absolutely the best made** — exclusive dynamically balanced armature; heavy windings develop up to 5000 watt overload for motor starting. Skid-mounted—portable. Powered by easy starting Briggs or 6 hp. Wisconsin engine —complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty and instructions included. Wt. 220 lbs. Reg. $585.00. Special at.... $299.50

With Electric Self Starter (Item 179) $359.50

GENERATOR ONLY and control box. Drive it with your engine or tractor $169.50

HI-LINE 6000 WATT PLANT

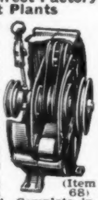
(Item 162) **Push Button Start,** 115-230 v. 60 cycle A. C. A brute of a power plant with a rugged 13 hp. Wisconsin engine. Plenty of electricity for ranges, water heaters, freezers, pumps, machinery, etc. Affords both 110 and 220 volts. Ideal where heavy current is needed. Wt. 590 lbs. Easily worth $995.00. (with self starter) Factory special $645.00

Same plant (with crank starter) (Item 166) Wt. 570 lbs.... $585.00

Generator and control box only, belt driven. Use your engine or tractor. Wt. 240 lbs............ $345.00

We Are World's Largest Direct Factory Distributors of Light Plants

Variable Speed Selector



(Item 68)

Heavy duty, made by **B. F. GOODRICH** for industrial use. Provides instant speed changes for any drive. For machine tools, dryers, printing, conveyors, production lines, hoists—any operation requiring variable speed. Ideal for midget autos. Employs reliable "trouble free" planetary system. No hydraulic power losses or creeping. Infinite range, smooth operation, easy installation. 3 sizes: ½-1 hp. wt. 36 lbs.; 1-2 hp. wt. 55 lbs.; 2-3 hp. wt. 105 lbs. Reg. list $228, $252 and $352. Brand new, in Goodrich boxes and guaranteed. Complete installation data included. Unprecedented surplus sacrifice **$79.50, $89.50** and **$114.50.**

HEATING & VENTILATING FAN

(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range, removes kitchen smoke and odors. Powerful continuous duty motor, 110-120 V. A.C. Quiet, super efficient fan moves huge volume of air (400 to 600 c.f.m.) 8" Fan, wt. 5 lb. **$6.35;** 9" Fan, wt. 6 lbs. **$7.45;** 10" Fan, wt. 7 lb. **$8.45;** 12" Fan, wt. 8 lbs. **$9.45.**

HIGH PRESSURE HAND PUMP

(Item 53) Positive displacement type. Cap. 550 gph. Completely self priming. 1" pipe thread inlet and outlet. Use for fuel or water transfer on boats, trailers, air craft, etc. Ideal for insecticides, emerg. sump pump or as vacuum pump. Wt. 15 lbs. Govt. cost $95. Our Special............ $12.95

GAUGE TESTER

(Item 27) Precision made of solid bronze and steel by Ashcroft. (Cat. #1300-5). Calibrated weights (incl.) acting against hydraulic piston provides quick accurate testing of all pressure gauges up to 500 psi. Brand new. Wt. 90 lbs. Reg. $318.00. Our Spec..... $95.00

IMMEDIATE DELIVERY—ALL ITEMS

HEAVY DUTY D-C ARC WELDER

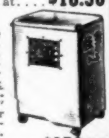
(Item 38)

Use as portable or shop welder. Up to 300 amps. Senior model. Made for years of trouble-free, continuous service. Will handle light or heavy jobs. Easily welds up to ¾" plate using ¼" rods. Built-in air-cooling system. Arc is easy to strike and hold, because of specially designed arc stabilizer. Hi-lo switch and dial control gives wide range of welding heats. Run welder at 2600 rpm. with tractor, jeep or 15 hp. gas engine, or 7 hp. elec. motor. Complete with instructions, guar. and double V belt or flat pulley. Wt. 110 lbs. A $400 value at.... $99.75

DUAL CONTROL MODEL same as above but with built-in dual rheostat for low heat soldering, brazing and welding. Special $119.50

WELDING KIT. Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at.... $10.50

A-C ARC WELDER



(Item 168) Master Hi-Line A-C Arc Welder. 20-190 amp. output. Welds or cuts iron, steel, brass, etc. from 24 gauge to ⅝" with single pass. Operates from 220/230 v. 50/60 Cycle A-C line. None better. Meets REA requirements. Handles 1/16" to ¼" rods. Adjustable output for any job. In sturdy steel cabinet, on casters. Full instru. and 1 yr. guar. incl. Wt. 210 lbs. Reg. $250 value...... $159.50

20-100 amp. A.C. Welder (Item 169) operates on 110 or 220 V. Wt. 65 lbs. Worth $125 .... $64.95

Welding Kit (Item 181) incl. helmet, 2 leads, electrode holder, ground clamp, power cord and rods (sold only with welder) Wt. 12 lbs. $12.50

CARRY-AIR

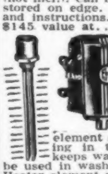
(Item 32) **Stainless steel tank—capacity 500 cu. in. at 400 lbs. press. complete with inlet and shutoff valves, press. gauge, detachable air hose, tire chuck. Fill at any service station.** Carry air for tire inflation, blowing out lines, spray painting, insecticides, etc. One emergency pays back cost. Wt. 10 lbs. Worth $20.00. Our price............ $8.95

(Item 55) With big double tank (1000 cu. in.)............ $11.95

POTTERS WHEEL

(Item 47) Complete, prof. equip. for making finest ceramics and pottery. Large dynamically balanced cast-aluminum reversible turntable with variable speed drive (38 to 140 rpm) controlled by foot-pedal. Built-in adjustable arm rests, water cup and wedging wire. 16x12" enclosed throwing table—ample area for largest pieces. Req. ¼ hp. motor (not incl.). Can be set up on 20x24" table and stored on edge. Complete with pulleys, belts and instructions. Wt. 26 lbs. $145 value at............ $59.95

Automatic Electric WATER HEATER



(Item 76) Immersion type 115 v. AC—1250 watts. Convert your present tank to modern automatic hot water heater. Long life Westinghouse or Chromalox element screws into std. 1¼ in. opening in tank. Adjustable thermostat keeps water at desired temp. Can also be used in washing machine or tub. Wt. 8 lbs. Heater element and thermostat regularly $49.50. Special........ $14.95

Heater only, for manual control. Wt. 3 lbs. **$7.95**

RUBBER HOSE

New genuine Neoprene Hose — outlasts ordinary rubber 3 to 1. Reinforced with super tough cotton cord plies. Flexible. Easy Flo brass couplings with standard pipe threads for quick connections, included. **Pump water for irrigation, stock tanks, home, barn, fire fighting, etc. Pump Gas or Fuel Oil.** Save more than 60%.

(Inside Diam.)	1"	1¼"	1¼"	1¼"	1½"
Length	10 ft.	25 ft.	50 ft.	100 ft.	30 ft.
Price	5.95	9.25	24.75	49.95	14.75

If specified we will send special hose for gas or oil at same prices.

Send 10c for a Big War Surplus Catalog. Included Free with Every Order.

MAKES SNOW REMOVAL REAL FUN!

SNOW-BLO

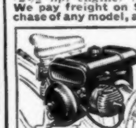
(Item 72)

The sensational device that makes snow removal real fun. Easy—a child can operate it. Safely guarded whirling impeller quickly scoops up the snow and blows it 25' either side. Big timesaver. Clears driveways and walks in a jiffy. Eliminates dangerous exhaustion and overtaxed heart, which kills so many every winter. BOYS! Make big money clearing snow for neighbors. Easily converted to lawn mower when desired. New silent electric model powered by ½ hp. motor clears 16" swath. Complete with shockproof 100' cord (Item 72)... $139.50

Gasoline Model with easy starting 2 hp. 4 cycle engine (Item 73).. $159.50

For large areas (2½ hp. engine) (Item 74)...... $179.50

We pay freight on Snow-Blos. FREE with purchase of any model, an extra 100' extension cord.



COMMANDO BIKE MOTOR

(Item 90)

New, super-modern 1952 model. This job is the Cadillac of all bike motors. Sensational Auto-Clutch prevents killing motor at each stop. Also selects proper ratio on hills. Mounts behind and drives rear wheel with Dynarotor. Free Wheeling lever permits pedalling if desired. Rear Mounting eliminates fumes, heat, dirt, and hard steering. Easily installed in 15 minutes with home tools. Sturdy, trouble-free, easy starting, light weight. Airplane type engine; up to 150 miles per gallon. Fully guar. Ride for fun or profit. Ideal for deliveries, paper routes, messenger service, etc. Ride to work and save.

The Commando Captain, 1 cylinder 1½ hp. $99.75

The Commando General, 2 cylinder 3 hp. (Item 91)...... $125.00

All Commandos shipped prepaid in U.S.

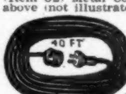
FIRE EXTINGUISHER

(Item 39) Fully charged (at 1,000 lbs. P. S. I. or more) with CO2 (carbon dioxide), the proven miracle fire fighting chemical that smothers oil, gasoline and electrical fires. Play safe; keep one in your car, garage and home. Heavy ICC approved steel cylinder, valve and 3000 lb. gauge that shows available remaining pressure. REFILLABLE at nominal cost. Hose included for emergency tire inflator or air blast. Wt. 4 lbs. $19.50 value. Special............ $6.95

GIANT BUNSEN BURNER

(Item 61) Operates equally well on gas or ordinary alcohol. Economical. 1 pt. burns for hours. Produces intense blue smokeless flame. Ideal for lab. or as emergency cooking unit. Fine for camping. Heavy brass burner with shut-off and adj. valve. Simple and safe. 5 ft. flex. hose, 1 qt. tank incl. Wt. 5 lbs. A $15 value. Special............ $4.95

(Item 62) Metal Cooking Stand for above (not illustrated)............ $1.49



EXTENSION CORD

(Item 16) 40 ft. **heavy duty,** made of specially insulated No. 14 2-conductor wire. So tough that you can drive over it and yet flexible and easy to handle. Resists oil, grease or water. Extends electricity up to 400 ft. without voltage drop. Use indoors or out. Complete with heavy rubber plug and outlet. Wt. 2½ lbs. Usually $4.50—Special 40 ft. **$1.99**

Comb: 2-40 ft. and 1-20 ft. (total 100 ft.) **$4.95**

100 foot length (one piece).......... **$4.85**

WIRE ONLY (Item 50) No fittings, 100 ft. **$4.00**

TIRE CHAINS

(Item 43) Extra heavy for dual truck tires, 7.50x20, triple side links, made by Intl. Chain. Reg. list $57.50—our special............ $19.50

32 pc. SOCKET SET

32-pc. Socket Set (Item 59) Highest quality guar. non-breakable sockets made by Husky. Beautiful, matched chrome alloy, absolutely the best. Complete range of 21 sockets from ¼" thru 7/16" in ¼" drive and 7/16" thru 1-1/16" in ½" drive; 2 extensions, reversible ½" ratchet, adaptor bit, slide head, all angle coupling, 2 end wrenches, speeder handle and sturdy metal tool box. For prof. mechanics who want the best. Wt. 14 lbs. Easily worth $41.50. While they last. $16.95

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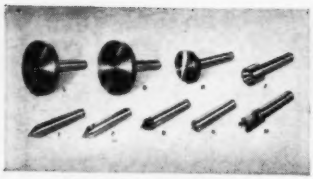

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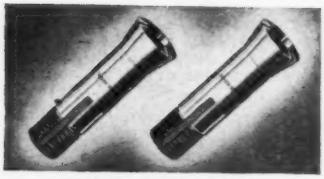

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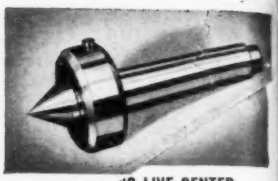

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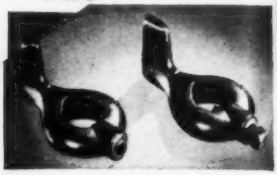

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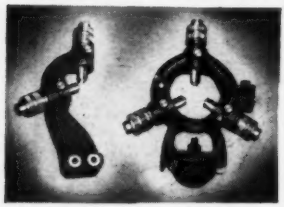

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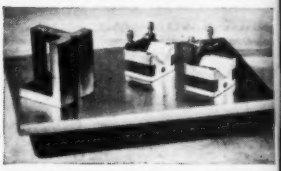

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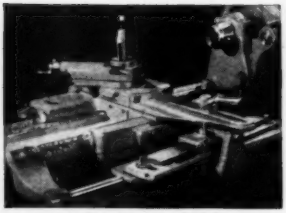

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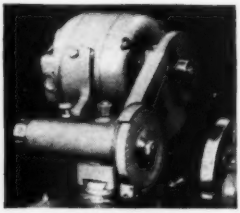

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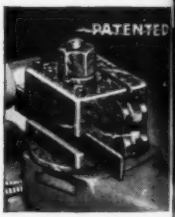

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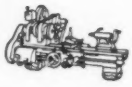

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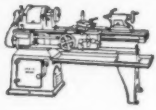

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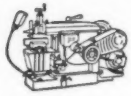

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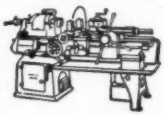

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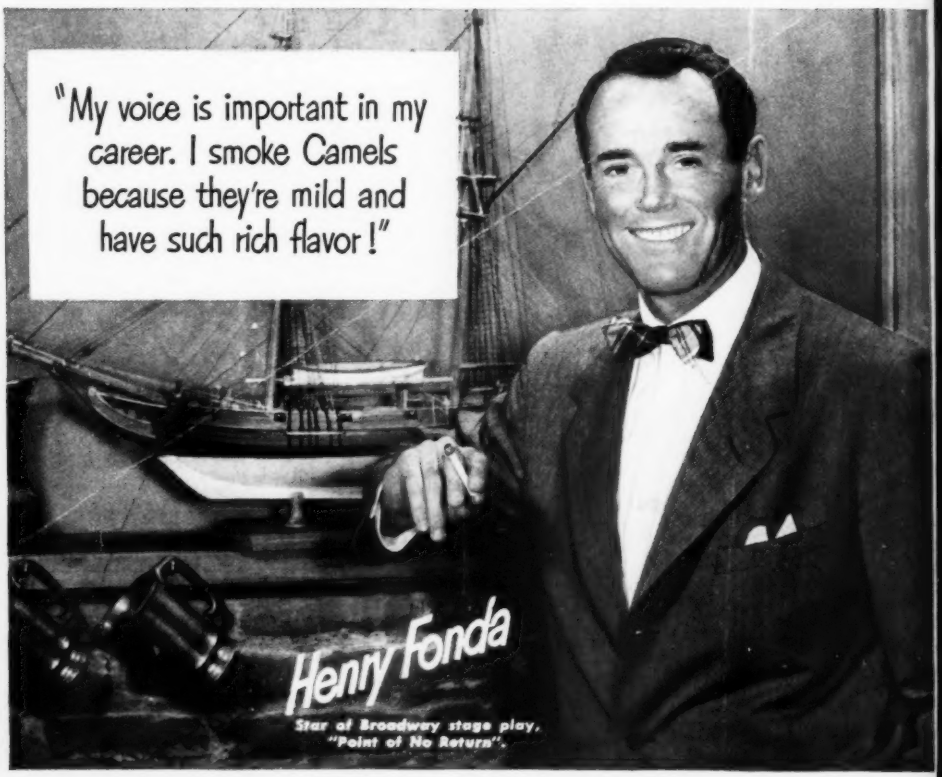

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